

**CIVIL DEFENCE
AN ANNOTATED
BIBLIOGRAPHY
1960 - 1968**

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CIVIL DEFENCE : AN ANNOTATED BIBLIOGRAPHY
(1960 - 1968) Malwad, N.M. (Compiler)

This is a selective bibliography including documents on civil defence against nuclear war, its effects on men and materials, preparations needed to face nuclear war such as construction of shelters, medical problems, food storage and supply, sanitation, ventilation, and the possible recovery after the nuclear war and so on.

It is based on Nuclear Science Abstracts (NSA) 1969 to Aug. 1969 and the report collection of the Depository Library, Bhabha Atomic Research Centre, Trombay and covers technical reports, periodical articles, papers presented at the conferences, symposia etc and books published during the period 1960-1968. The bibliography comprises three parts, namely,

Part A : Bibliographies

Part B : Reports

Part C : Periodical Articles, Books, Papers
presented at the conferences.

Reports are arranged according to the report numbers and the entries in Part C are arranged alphabetically according to the author's name. Under each entry, the minimum required bibliographic data such as report number, title, sub-title, first two authors, bibliographic citation, year of publication and abstract are provided. Language of the report, if other than English, is indicated in brackets after year.

Availability of the reports in the Depository Library is indicated in brackets. The abbreviations used are:

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[f] for microfiche
[R] for full-size report
[C] for microcard
[BK] for Book

The periodical abbreviations are the same as followed by NSA. Cumulative author, and subject indexes for all the three parts are provided. Report number index is also provided to bring out the relation, when more than one report number appears on the report.

I thank all my colleagues for their suggestions and particularly I am grateful to Dr. V.A. Kamath, Scientific Information Officer, B.A.R.C., for his guidance and encouragement without which the compilation would have been practically impossible. Last but not the least, I thank Mr. M.A. Uttamchandani for the typing work.

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PART A : BIBLIOGRAPHIES.

BIB-1) AD-299189 (Suppl.1)

PROTECTIVE CONSTRUCTION. : A Report Bibliography.

Mar. 1963.

Abstract: A selected list of 30 references related to the construction of strategic military facilities to resist either nuclear or conventional explosives is presented. Entries include references to reports pertaining to characteristics of nuclear explosions, propagation of shock waves, underground explosions, soil mechanisms, and response of structures to blast.

BIB-2) AD-405962

WEAPONS.

Defense Documentation Centre, Arlington, Va.

June 1963.

Abstract: A bibliography of 106 references is presented on hazards of atomic explosions, radiological warfare and defense, and biological warfare and defense. Most of the references are from foreign sources, particularly Russian ones.

BIB-3 AD-634204

THERMAL EFFECTS OF NUCLEAR WEAPONS. LITERATURE SUMMARIES.

Sachs, Abner et al.

Jan. 1966.

Abstract: Information from 40 papers published on the thermal effects of nuclear weapons is summarized for use in developing a thermal effects model to be part of a generalized damage assessment model for the effects of nuclear weapons on the inhabitants and economy of a city. Tables figures, and other supporting data are presented. Because of continuing interest in developing the methodology of a thermal effects submodel, the literature will be surveyed and pertinent data summarized in later addenda to this volume.

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BIB-4) ANRE-E-4/67

SURVEY OF REPORTS ON EXPERIMENTAL STUDIES OF THE FORCES EXERTED ON MODEL STRUCTURES BY THE WIND AND BY BLAST.

Uppart, J.E.

[R]

May 1967.

Abstract: An extensive bibliography of the work which has been performed in many countries and over a long period of time, on the forces exerted by a flow of air, or by blast waves, on model scale structures is presented. Abstracts are given for reference to the more important experiments performed under steady flow conditions in wind tunnels, and blast-wave studies performed in shock tubes.

(NSA:21:30651)

BIB-5) ORNL-CD-2

INDEXES TO 780 UNCLASSIFIED DOCUMENTS ON CIVIL DEFENSE

Levey, Joanne S. et al.

[f]

Jan. 1968.

Abstract: A bibliography containing 780 references to reports and published literature on various aspects of civilian defense is presented. The bibliography contains bibliographic, keyword, corporate author, and personal author indexes.

BIB-6) ORNL-CD-4

INDEXES TO 563 UNCLASSIFIED DOCUMENTS ON CIVIL DEFENSE

Levey, Joanne S. et al. (ed)

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Apr. 1968

Abstract: A bibliography containing 563 references to reports and published literature on various aspects of civil defense is presented by the Director's Division Civil Defense Research Project.

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The bibliography contains bibliographic, Keyword, Corporate author, and personal author indexes.

BIB-7) SB-501 (Suppl.1)

CIVIL DEFENSE: Selective. Bibliography of Government Research Reports and Translations.

Clearinghouse for Federal Scientific & Tech. Inf., Springfield, Va.
1965.

Abstract: Approximately 160 references, some with indicative abstracts are presented.

(NSA:19:42661)

BIB-8) Kernahan; D.A.

REVIEW OF THE LITERATURE ON BURNS AND TRAUMA, SEPTEMBER 1962 TO AUGUST 1963.

Med. Serv. J. (Can.) 20:315-51 (Apr. 1964)

April 1964.

Abstract: An extensive review of the literature on burns and trauma, including 528 references, was prepared for the Defense Medical Research Advisory Committee of Canada. In addition to a review of thermal burns, and other injuries caused by radiation are discussed. The injuries which may result from thermonuclear weapons are described. At a distance of 15 miles from a 20-Mt explosion, glass fragments would have a velocity of 170 ft/sec. At 4.8 miles from ground zero the heat on an exposed surface would be 700 cal/cm², and 10 cal/cm² gives a severe second-degree burn. The leucocyte count is given as the most reliable prognostic indicator after irradiation. There is a consistent correlation between depression of the leucocyte count and death in the third to fifth week after injury. Reports on the environmental effects of radiation are cited. Natural radiation still is far in excess of that resulting from fallout. Two weeks after a detonation the radiation effects of a 20 - Mt weapon would be reduced by a factor of 1000. Other topics discussed include 90 Sr levels in human bones, preponderance of girls over boys in children of Japanese survivors (indicating sex-linked mutations), treatment of radiation sickness,

(VI)

and effect of oxygen on radiosensitivity.

(NSA:19:19555)

BIB-9) Pace, F.C. and Waters, W.R.

CASUALTIES FROM NUCLEAR WEAPONS. IV. APPENDICES AND BIBLIOGRAPHY.
A MANUAL FOR EMERGENCY HEALTH SERVICES, CANADA.

Med. Serv.J. (Can.) 19: 531-76(July-Aug. 1963)

Aug. 1963.

Abstract: A bibliography citing 40 monographs, symposia, and selected articles on civil defense is provided.

BIB-10) United States Arms Control and Disarmament Agency.

DOCUMENTS ON DISARMAMENT.

1963.

Abstract: See entry No. 373.

(NSA:19:5597)

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1) AD-261739

NUCLEAR WEAPON CASUALTIES-EFFECTS ON PERSONNEL. :Final Report.

Smith E.H. and Co., Silver Spring, Md.

May 1961.

Abstract: Early casualty data (0 to 8 hr) for very high neutron plus gamma doses are given. An equation is given for calculating effective dose at time t under an irradiation rate varying with t for total-body or partial-body irradiation. The relative values of the PBE's of photons and neutrons are discussed. A discussion is presented of the effects of clothing and of exposure to pulses of irradiation from large weapons. Pertinent data on thermal burn casualties are tabulated. The critical translational speed for injury is shown to be 20 ft/sec. The critical over pressure for serious injury or death to personnel in rooms or buildings is found to be about 5 psi. The speeds attained by men and missiles are given as functions of the drag coefficients and the blast injury is found to be 35 psi. The problems posed by combined thermal-nuclear injury are described.

(NSA:16:13387)

2) AD-264822

RADIOLOGICAL DECONTAMINATION OF FOOD AND WATER IN NUCLEAR WAR.

Ostrom, Thomas R.

Management of Mass Casualties Publication No. 593.

Sept. 1960.

Abstract: With existing supplies it is possible to provide food and water for military and civilian populations after a nuclear attack. There are extant methods for decontaminating water livestock, and packaged foodstuffs. The population must be educated to waste nothing.

(NSA;16:16591)

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- 3) AD-276187 (CONF-610691-1)

THE ESTIMATION OF THE INTERNAL RADIATION EXPOSURE RESULTING FROM THE INGESTION OF FALLOUT-CONTAMINATED WATER IN A NUCLEAR WAR.

Hawkins, Myron B.

June 1961

Abstract: The over-all problem of controlling internal radiation exposure resulting from the ingestion of water contaminated by fallout in wartime is discussed. The limitations of maximum permissible concentration concepts in areas where fallout contamination levels are high are discussed and simplified methods of computing the internal dose are presented. To facilitate the interpretation of such information, the committed dose concept is introduced and its proposed use is described. A brief discussion of the significance of the hazards of fallout-contaminated water supplies relative to other hazards in the nuclear-war situation is presented.

(NSA:19:46633)

- 4) AD-286933

ATTITUDES AND KNOWLEDGE CONCERNING FALLOUT SHELTERS IN AUSTIN, TEXAS.

Moore, Harry Estill.

Jan. 1962.

Abstract: A comparison of the knowledge of and attitudes toward home fallout shelters and related topics was made in Austin, Texas, during the Autumn of 1961. The study falls into three parts: the extent of knowledge possessed by citizens of Austin regarding fallout shelters and similar aspects of potential danger from open warfare; their attitudes toward such shelters, the Civil Defence organization, and the probability of nuclear attack in case of war; and the comparison of the two panels of informants in terms of these two factors.

(NSA:17:37362)

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5) AD-401687

RADIOLOGICAL MONITORING: CONCEPTS AND SYSTEMS.

Bothun, Richard B. & Laurino, R.K.

Feb. 1963.

Abstract: Guidelines for design of radiological monitoring systems were developed from an analysis of the radiological information requirements over time of the principal organizational elements of civil defence, with respect to the emergency and recovery phases. Constraints on the design criteria of both fixed and mobile systems were defined as indicated by the information which they must provide. Fixed monitoring systems were studied with respect to station spacing, intensity, reporting levels, accuracy of equipment, and related design specifications. The operational constraints and the techniques of deployment of mobile systems were also considered. Specifications of instrument accuracy were developed from considerations of both the accuracy with which dose can be related to the biological effect and the precision of radiological information required to support civil defense operations. The functions of monitoring instruments within shelters were reviewed, and their requirements for accuracy and range were developed. Initial investment and annual operating costs were estimated selected systems.

6) AD-401761 (TRL-397)

TRAINING MANUAL FOR RADIATION MONITORING TEAMS

Briggs, Richard J.

Dec. 1962.

Abstract: Basic information and guidance are presented for the training of radiation-monitoring teams made up of candidates with little or no knowledge of atomic or nuclear radiation. As a practical approach to the subject of radiation biology, a brief review of the relevant mathematics and physics is presented. Familiar examples and situations are used to illustrate important aspects and procedures, and finally, specific action and details are set forth as a guide for team action.

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Radiation monitoring teams are of primary importance in the initial handling of any accident involving radioactive material. The training and skill acquired by such teams may well be the factor of control required in emergencies until more highly trained personnel are available. These teams add immeasurably to the ability of ships and other activities in coping with all phases of control of radioactive contamination, and also in supplementing work done by more highly skilled and trained personnel.

7) AD-403714

FOOD SERVICE PROCEDURES IN FALLOUT SHELTERS

Cornell Univ., Ithaca, N.Y. School of Hotel Administration.

April 1963.

Abstract: A study was made of the management problems involved in the procurement, storage, preparation, and service of water and food in fallout shelters having a capacity of 50 or more occupants. Particular attention was given to the composition, quality, quantity, and variety of foods capable of being easily stored, prepared, and apportioned under emergency conditions at minimum cost. The Civil Defence rations provided for public shelters are compared with those provided for semi-public shelters where these rations are supplemented with other foods. Other phases of shelter management considered include space allotment for occupants and food services, ventilation, temperature, sanitation, and odor control.

8) AD-404511

THE FALLOUT PROTECTION BOOKLET: I. A REPORT OF PUBLIC ATTITUDES TOWARD AND INFORMATION ABOUT CIVIL DEFENSE

Berlo, David K. et al.

April 1963.

Abstract: A study was made of the impact of the "Fallout Protection" booklet which was published by OCD in December 1961. While collecting data specific to that objective, other useful information in public information about and attitudes toward civil defence was collected.

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Data are presented on the accuracy of public knowledge about nuclear attack and civil defence, the favorability of public attitudes toward civil defense measures, public perceptions of the threat of nuclear war and the personal dangers represented by nuclear attack, the relative effectiveness of various shelter inducements and inducement agents, and the level of public exposure to shelter information. Analyses of attitudinal and demographic correlates of shelter knowledge, belief, and plans are also presented.

9) AD-404512

THE FALLOUT PROTECTION BOOKLET: II. A COMPARISON AMONG FOUR GROUPS OF DIFFERING LEVELS OF INTEREST IN SHELTER CONSTRUCTION.

Berlo, David K.

April 1963.

Abstract: A study was made of the impact of the Fallout Protection booklet which was published by OCD in Dec. 1961. While collecting data specific to that objective, other useful information relevant to public information about and attitudes toward civil defense was collected. Data are presented from an analysis of respondents, who were classified into four levels of interest with respect to constructing family shelters.

10) AD-405930 (OAD-RM-106)

LINCOLN SHELTER UTILIZATION STUDY. VOLUME II. A SHELTER ASSIGNMENT PROCEDURE

Gualtieri, Angelo & Jensen, Gordon F.

April 1963.

Abstract: A step-by-step process of assigning the population of Lincoln, Nebraska, to fallout shelters is discussed. The techniques developed can readily be applied to numerous cities having characteristics similar to those of Lincoln, Nebraska.

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Large census tract maps can be designed and used in assigning blocks of people to shelters. Method of developing day and night-time populations data for any given city are described. A technique of putting the shelter assignment on data-processing cards for information retrieval is discussed. Methods of sorting punched cards into useful shelter assignment reports are presented. Considerable attention is given to demonstrating the numbers of people who would be sheltered under three separate warning times. Certain rules, based on the natural behaviour of people, are developed as an aid in the assignment process. Estimates of cost and effort expended are provided as a guide to any civilian defense official who would desire to use the technique described therein.

11) AD-405962

WEAPONS

Defense Documentation Centre, Arlington, Va.

June 1963.

Abstract: A bibliography of 106 references is presented on hazards of atomic explosions, radiological warfare and defense, and biological warfare and defense. Most of the references are from foreign sources, particularly Russian ones.

12) AD-409421 (HI-243-RR)

SPECIAL ASPECTS OF ENVIRONMENT RESULTING FROM VARIOUS KINDS OF NUCLEAR WARS

Ayres, Robert U.

June 1963.

Abstract: Ecological aspects of a post-attack environment are considered. Emphasis is placed on radiological warfare effects on food chains, diseases and pests, and abiotic factors such as weather and soil and water conservation. Information on radiosensitivities of various organisms and radionuclide cycling are summarized. Recommendations are made pertaining to ecological factors and their influence on survival.

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13) AD-410522

FALLOUT AND RADIOLOGICAL COUNTERMEASURES. VOLUME I.

Miller, Carl F.

Jan. 1963.

Abstract: Data applicable to civil defense planning for protection against fallout from nuclear explosions are presented. Topics discussed include the nature of fallout, characteristic types of fallout; potential hazards from fallout; the formation of fallout particles; a thermodynamic model of fallout formation; the distribution of fallout particles following a nuclear detonation; the correlation of scaling-model parameters with observed fallout pattern features; and ionization rate contour ratios and the composition of fallout. A subject index is included.

(NSA:19:46585)

14) AD-411787

EMERGENCY HEALTH PROBLEMS STUDY. VOLUME I.: Final Report.

Herzog, W. T.

July 1963.

Abstract: The peacetime health status of the population (Based on the U.S. Public Health Service National Health Survey) and the estimated range of complications due to shelter living were evaluated. Rough estimates suggest that medical care and public health measures could add a number of survivors equal to 1 to 2 % of the total pre-attack population during a single two-week period under ideal conditions. Postattack medical care of casualties would not seriously complete with measures directed toward health maintenance of the general population, except for consumable medical supplies. Because casualty care and health maintenance of noncasualties are capable of adding comparable numbers of survivors during the shelter period (A maximum of 2 % of the preattack population for either type of emphasis), it is concluded that both approaches should be emphasized. The available data on chronic, noncommunicable diseases are sufficient to allow more quantitative

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stockpile planning of medical items for these conditions in shelters. Further research will be necessary before this is true for communicable diseases, because of the complexity of disease spread during shelter confinement. A method for optimizing the allocation of drugs for support of noncommunicable chronic and acute conditions to shelters in a stockpiling program is suggested and illustrated by an example

15) AD-412431

DETERMINATION OF PARAMETERS FOR RADIOLOGICAL PREDICTION AND MONITORING SYSTEMS

Reimers, P. et al.

June 1963

Abstract: Design concepts and parameters are presented for two radiological monitoring systems for civil defense. These are a shelter-based system, and an automatic system. Gamma radiation intensities up to 1000 r/hr can be monitored. Recommended spacing of sensors is based on computer simulation of accuracies obtainable with various sensor spacings. Various combinations of instrument error, fallout pattern, probability of instrument malfunction, and orientations of the sensor network were used in these simulations. Initial costs and annual operating costs are estimated.

16) AD-412733

FEASIBILITY OF ACTIVE COUNTERMEASURES FOR THERMAL RADIATION EFFECTS OF NUCLEAR WEAPONS. :Final Report.

Goodale, T.C.et.al.

July 1963.

Abstract: The effectiveness and practicality of active countermeasures to the thermal effects of nuclear detonations were investigated. The use of smoke screens to attenuate the incident thermal radiation below damaging levels appeared to be the most practical countermeasure for large-area application. The investigation included review of available information on active countermeasures, study of radiation attenuation by individual particles and clouds of particles, study of the theory of smoke-

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producing reactions, development of preliminary smoke-screen system design procedures, and preliminary cost-effectiveness analyses of several candidate smoke-screen systems. The major conclusions are: (1) Smoke screens composed of absorbing particles appear to be more effective and less expensive than screens composed of scattering particles; (2) Effective screens can be produced and maintained under a wide variety of weather conditions; (3) Anticipated costs of smoke-screening systems are estimated to be as low as \$100,000 per square mile; and (4) Wind-dispersed screens appear to be the most practical at present. Recommended are rapid development of prototype hardware for interim screening systems as well as a research and development program leading to screening systems with optimum performance for minimum cost.

17) AD-413416

ENVIRONMENTAL CONTROL SYSTEMS FOR CLOSED UNDERGROUND SHELTERS

Charanian, T.R. et al.

April 1963.

Abstract: An investigation and cost analyses were made of atmosphere control techniques for use in closed underground fallout shelters. Internally located, self-contained environmental control systems are required for shelter atmosphere control whenever the presence of nearby outside fires precludes the supply of outside air to the shelter. Environmental control systems which were evaluated included all conceivable types of oxygen supply, carbon dioxide and toxic constituent removal, and temperature and humidity control. The project was divided into four principal categories: study of man's physiological environmental requirements, engineering evaluation and analysis of all conceivable systems, experimental investigations of candidate systems, and application study for selection of the appropriate system for particular shelter types.

18) AD-415614

SHELTER MEDICAL SUPPORT SYSTEM STUDY. Final Report. OU-107. PART I. ANALYSIS OF EXTERNAL MEDICAL SUPPORT SYSTEM STRATEGIES

Herzog, W.T.

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PART II. ILLNESS SPECTRUM AND PATIENT CASELOAD, DURHAM-ORANGE
COUNTY, NORTH CAROLINA

Wells, Warner & Cromartie, William James.

Aug. 1963.

Abstract: Part I. Various policies of allocating medical resources (manpower and material) in an area network of public fallout (PF) shelters during a post-nuclear emergency period of two weeks are reviewed. It is concluded that a policy of assigning medical resources to large shelters is superior to concentrating them in hospitals or treatment centres. The near optimal strategy requires dispersal of physicians in high PF shelters, because of their potential value in the post-shelter period. In fallout only environments, medical support of the population would place minimal demands on the transportation, shelter management, and warning systems. Demands on the communications system are likely to be excessive. Recommendations of additional research for medical planning are included. Part II. Background data essential for the measures of effectiveness used in Part I are presented. Treatment requirements and expected fatality (At various levels of medical care) of the hospital emergency room caseload in Durham-Orange Counties, N.C. are described.

19) AD-417502

CRITICAL INDUSTRY REPAIR ANALYSIS. ELECTRIC POWER.
:Final Report.

Powley, Randle H. & Fernald, Olaf H.

1962

Abstract: In general, vulnerability studies of electric power plants indicated that the critical blast-damage levels for the hydroelectric facilities would be higher than those for the steam plant. Similarly, fallout hazards would be less serious at the hydroelectric plant than at the steam plant. Thermal radiation was not a major structural factor at any of the plants under consideration. The plant studies agreed that production at most facilities would be interrupted by flying glass at blast overpressures with the range of 0.1 to 1.0 psi.

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20) AD-419518

CRITICAL INDUSTRY REPAIR ANALYSIS: STEEL: Final Report.

Fernald, Olaf H. & Powley, Randle, H. ed.

Abstract: A comprehensive analysis was made of the relation of the processing environment and vulnerability of representative raw-material and iron/steel-producing facilities in a critical steel complex to repair and recovery from the effects of thermonuclear attacks. The scope includes special attention to salient bottlenecks in the operation and flow of the process from basic raw materials through finished production. Significant potential damage, general repair considerations, and production operations were studied at a large steel complex on the Ohio River in western Pennsylvania; raw materials were studied at the installations of some suppliers of this plant. The processing of the three primary raw materials, coal, ore, and limestone, was treated both as part of the complex and as a separate entity from the standpoint of potential damage.

21) AD-419910

LOGISTICAL ASPECTS OF RADIOLOGICAL MONITORING INSTRUMENTATION.

Witzel Frederik DeBoom

April 1963.

This study is an analysis of the logistical problems of requirements planning, procurement, maintenance, storage, calibration and inspection of existing radiological monitoring instruments in the radiological monitoring system and the community shelter program. Emphasis is placed on methods and procedures to improve the operational readiness of this equipment.

(NSA:10:7779)

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22) AD-420825

WEATHER-AWS PARTICIPATION IN RADIOLOGICAL DEFENSE PROGRAMS.

Air Weather Service, Scott AFB, ILL.

Oct. 1963.

Abstract: Standard procedures are presented that are to be followed by Air Weather Service (AWS) units participating in disaster control programs, including the observation and reporting of nuclear detonations and the assistance provided through fallout plots.

(NSA:19:9364)

23) AD-422319

DEBRIS CLEARANCE STUDY. :Final Report.

Ahlers, Edward B.

Sept. 1963.

Abstract: Problems involved in the removal of debris resulting from a nuclear attack on cities are reviewed. Six blocks of a neighborhood business district in Chicago were selected to depict the debris levels likely to exist in outlying commercial districts of major cities or in central commercial districts of smaller cities. Calculated debris levels in these blocks ranged from 1.6 to 7.2 ft with an average of 3.8 ft. Average debris depths calculated for the central business district of Chicago was 12.6 ft. Data are included from estimates of debris depths for streets in various types of neighborhoods. Procedures used for estimating gross debris accumulation and the analysis of blast-wind-induced trajectories of structural fragments are described. Emphasis was placed on estimates of the depths of rubble that may be expected to cover shelter entrance-ways and transportation arteries. The capabilities of removal equipment and manpower for debris removal are estimated. The effects of fallout on problems of debris clearance are also considered. Emphasis is placed on the need for pre-disaster planning of clearance measures.

(NSA:19:9402)

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24) AD-423696

MEDICAL CARE IN SHELTERS. A REFERENCE MANUAL FOR ALLIED HEALTH WORKERS AND SELECTED, TRAINED LAYMEN.

Public Health Service, Washington, D.C.

Dec. 1963.

Abstract: This manual is intended as a quick reference guide for allied health workers and selected, trained laymen charged with the responsibility of administering shelter medical care in the absence of a physician. Its purpose is to aid them to quickly determine the treatment, under the austere limitations of the shelter, based on common symptoms rather than the uncertainties of inexperienced diagnosis.

(NSA:19:12892)

25) AD-424694

DEBRIS CLEARANCE STUDY.:Summary of Research Report.

Ahlers, E.B.

Sept. 1963.

Abstract: This initial study of problems involved in clearing structural debris in cities after nuclear weapon attack was directed toward identifying the major problems involved and performing limited technical studies in several of the problem areas. Procedures were developed for estimating gross debris accumulation in various types of urban areas, based on complete structural demolition and uniform distribution of the fragmented materials. Theoretical studies on the fragmentation process were initiated toward quantifying and fragment-size distribution of demolished structural elements. Estimating tables were prepared to indicate the capacities of excavating equipment in removing debris. Major problems involved in planning and scheduling debris removal operations and the essential elements of a clearance program are described. Associated problems resulting from radioactive contamination of the rubble are discussed.

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(NSA:10:15776)

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26) AD-426044

VULNERABILITY OF WATER SYSTEMS. A study of the Vulnerability of water systems to Radioactive Fallout and Methods of Increasing their survivability.

Oct. 1963.

Abstract: The vulnerability of water supply systems to contamination by fallout is reviewed. Various means of protecting them as well as alternate emergency operating procedures are considered. The effect of numerous physical parameters and the significance of certain attributes of system components are discussed. Alternate sources of potable water are reviewed and estimates made of their potential quantities. The results of this phase are compared with a spot check made on an arbitrarily selected city. A comparison was also made of Civil Defense procedures of vital facilities in order to determine preferred methods of protection, and the relationship and application of these methods to water supply systems.

27) AD-427995

IMPROVEMENT OF PROTECTION DATA BASE FOR DAMAGE ASSESSMENT AND DATA BASE ON SHELTER NEEDS; :Final Report. Vol.15

McMullan, Philip. et al.

Jan. 1964.

Abstract: Results are reported for five studies concerned with obtaining, compiling, or analyzing fallout shelter protection data. Subjects covered include: a review of the residential basement data which were obtained from the 1960 U.S. Census of Housing; an examination of electric power availability in the postattack period, with emphasis upon fallout protection in power plants; the preparation of a procedure for extracting summary distributions of overpressure, reference intensity, and fallout arrival time and relating these to numbers of people exposed; on the basis of data extracted from the Attack Environment III output tapes of the Jumbo III damage assessment system; the re-evaluation with National Fallout Shelter Survey (NFSS) data, of an analytical model for predicting fallout protection for people as a function of their distance from

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the centre of a city, and a statistical analysis of NFSS data from Houston, Texas, and Durham, N.C., performed to determine distribution functions expressing their shelter characteristics. These analytical representations of NFSS data are applied, in an illustrative example, to optimal allocation of improvement dollars to ventilating below ground shelters to increase their capacity.

28) AD-428008

IMPROVEMENT OF PROTECTION DATA BASE FOR DAMAGE ASSESSMENT AND DATA BASE ON SHELTER NEEDS. :Final Report. Vol. 1

McMullan, Philip.

Jan. 1964.

Abstract: The procedures devised for using the National Fallout Shelter Survey (NFSS) data in damage-assessment systems and civil defense systems evaluation are reviewed. A procedure for using NFSS data in existing damage-assessment systems is devised, programmed for the UNIVAC 1105, and tested in the Jumbo III system of the National Resource Evaluation Centre. Test results, using a single attack pattern and Phase 1 NFSS data, show significant fallout casualty reductions over previous estimates. Category 1 shelter (PF 20 to 39) contributes substantially to this reduction. The results also show fallout casualties to be quite sensitive to the movement-to-shelter assumption casualty results from a test assuming country-wide population mobility are significantly less than those obtained when movement is limited to within a standard location. A transportation problem formulation is used to simulate the movement of people to shelter within a city. The solution to the problem when so formulated allocates people to shelter in a manner to maximize survivors (or other objective functions). Tests over a range of fallout environments using this information show that the minimum fatality allocation to shelter is particularly sensitive to fallout build-up, movement through fallout, and shelter PF's. An equivalent residual dose (ERD) model which computes ERD in a time-varying radiation environment is programmed for the IBM 1620 and 7072. It has been found that the peak ERD after emergence may exceed the peak ERD in the initial shelter. The shelter allocation model and the peak ERD model from the basis for the Mainline Computer Program, a procedure for computing

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the survivors added by alternative CD system improvements. This program is currently being developed into a working tool for CD systems evaluation.

29) AD-431930

BULGUR WAFER AND ADJUNCTS FOR FALLOUT SHELTER RATIONS

Department of Agriculture. Western Regional Research Lab.,
Allany. Calif.

Dec. 1963

Abstract. Long-term (5-year) studies of the storage life of bulgur wheat survival wafers and adjuncts (foods to serve with the wafers to vary fallout shelter menus) are in progress. In order to shorten the time required to obtain estimates of storage stability, methods to speed deterioration are being investigated. Chemical-physical analyses are being made in a search for an objective test that correlates with organoleptic evaluation. Components of the wafers from rancid bulgur have been isolated by use of gas-liquid chromatography; some components may be useful indicators of incipient rancidity. Natural antioxidants in wheat have been found to disappear early in the bulgur-making process. Tests of various bulgur-puffing techniques have been made and are reported, including processing effects on texture of the bulgur. Wafers formulated with materials reputed to alleviate radiation effects have been tested, and some flavoring additives have been tried. Fifty-eight adjuncts have been developed and evaluated. A plastic bag for mixing and dispensing adjuncts has been designed for use in the shelters.

30) AD-431995

ANALYSIS OF SURVEY DATA. Summary of Final Reports.

Hill, E.L. et.al

Feb. 1964.

Abstract: A review is presented of the National Fallout Shelter Survey findings to estimate probable error or reliability in the light of existing experimental data and theoretical considerations.

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The surveyed structures are categorized with respect to technical shielding characteristics and new information on shielding is evaluated for application to the computation of protection factors for the surveyed structures. The feasibility and importance of developing special computational programs for the several categories determined and additional programming for analysis of the survey data are discussed.

31) AD-432345

RADIOLOGICAL MONITORING STUDY

Baietti A.L. and Zirkes Al

Nov. 1963.

Abstract: Radiological monitoring systems for use following a nuclear attack are reviewed. A system is recommended that uses a combination of flash reports for the preparation of fallout contour maps, unshielded land vehicles for transportation, and monitoring on foot. The major advantages of this combination are low cost, simplicity, and low personnel exposure. The Appendix gives proposed procedures for applying scaling factors and plotting a number of selected contours.

32) AD-450228

ANALYSIS OF POSTATTACK FOOD PROCESSING AND DISTRIBUTION. :Progress Report.

Billhelmer, J.W. and Dixon, H.L.

June 1964.

The initial phases of a study designed to model the effects of the food processing and distribution system of the United States on the postattack flow of contaminated food-stuffs is described. A modeling method is proposed that employs utilization charts, seasonal supply graphs, and various production-consumption time lags to provide a quantitative description of commodity flow patterns. These quantitative indices are assigned postattack values through the use of damage assessment procedures designed to fit existing food inventory data. The techniques proposed in this report are used to describe the probable

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processing and distribution patterns followed by milk and wheat products after a wired counterforce and city attack based on a high threat level.

(NSA:19:4391)

33) AD-450606

RADIOLOGICAL RECOVERY CONCEPTS, REQUIREMENTS, AND STRUCTURES.
VOLUME I. GENERAL CONSIDERATIONS. :Final Report.

Eyan G.T. et.al.

Oct. 1964.

Abstract: The effectiveness and costs associated with the application of decontamination to accelerating recovery of an activity in a postattack fallout environment is examined. The effectiveness is measured in two ways: first, by the fractional reduction in dose rate that can be achieved by decontamination, and second, when the dose received during the activity is specified, by the fractional reduction in denial time that can be achieved by decontamination. The costs are described in terms of the personnel and equipment required for the decontamination, the radiation doses received by the personnel, and the water required by the operation. The recovery of an activity is defined in terms of radiation doses received by the activity personnel in performing the activity. When these doses are reduced to an acceptable safety level by reducing the dose rate in the activity area, the activity is said to be recovered. The above dose constraints are expressed both in terms of the maximum total dose and in terms of the maximum equivalent residual dose. The primary conclusion reached, that decontamination is as vital to recovery as shelters are to survival in a fallout environment is the basis for recommending further studies analyzing the application of decontamination to integrated whole-city recovery.

(NSA:19:4393)

34) AD-465567 (Rept.1-110)

DESIGN OF MODEL TEST PROGRAM FOR A BURIED FIELD SHELTER.
:Final Report.

Newmark, N.M. et.al.

May 1965

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Abstract: This report is on the development of a standard underground protective shelter to be used by troops in forward battle areas. This structure is designed to withstand a ground surface air over pressure of 100 psi from a megaton size nuclear weapon and the additional nuclear effects associated with the detonation. The shelter is a buried, semicircular arch with a prototype diameter of 16 ft and 48-ft length. The scale of the model developed is 1 to 4.5. This structure would be prefabricated of wood and steel sections and furnished to commanders in modular kit form so as to minimize necessary construction skills, equipment, and time. Included in this report are; (1) derivation of model scaling, laws, (2) selection of model materials, (3) determination of the size of the model from considerations of test container effects such as sidewall friction and loading, (4) estimates of the model response, (5) a recommended testing program, and (6) instrumentation recommended to define the response of the structural model.

35) AD-600261 (EMEC-15328)

FIRE HAZARD TO FALLOUT SHELTER OCCUPANTS: A CLASSIFICATION GUIDE

Smith, J.B. et al.

April 1964.

Abstract: A method of classifying the hazard from fire to occupants of fallout shelters is presented. It represents, in the form of a simple survey, a conservative fire-protection-engineering approach with a high confidence factor. The intention of this study is not to relate fire safety to weapons effects; instead it addresses the problem that, should fires occur from any cause, would the occupants of a particular shelter be safe from fire? Further, the guide does not attempt to define the relative degrees of hazard, or probability of hazard, for non-sprinklered shelter buildings which are not unequivocally considered safe. Assuming that fires from any cause have occurred following a nuclear attack; that there is no fire storm; that there will be no fire fighting by public fire department; that public water supplies and electric utilities will be in service; and that automatic sprinklers, as available, will be in service, the fire hazard to shelter

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occupants is analyzed. Safe separation distances between buildings were determined from British work and some conservative simplifying assumptions. A manual, 'Fire Hazard to Fallout Occupants: A Classification Guide,' was prepared for the use of architects and a consulting engineer. Trial surveys were made at existing designated shelters in buildings of varied construction, occupancy, and age, in relatively congested areas. In general, the guide was found to be simple and easy to use. Consistent results were obtained.

36) AD-600423

MOISTURE IN SURVIVAL SHELTERS. :Summary of Research Report.

April 1964.

Abstract: Results are summarized from a study of sources of moisture and condensate in occupied and unoccupied shelters including the effects of climate, ground water, permeability, ventilation, latent heat, dew point, and surface temperatures. An investigation of promising methods for reducing humidity, preventing leakage of moisture into shelters, and controlling moisture and condensate was conducted. Commercial dehumidifying apparatus for use in survival shelters was evaluated. Chemicals which might be suitable for the absorption of moisture and the control of shelter humidity were investigated. Comparative tests were performed on the basis of the information developed during the above evaluations. Conclusions were drawn and recommendations were made with respect to suitable apparatus and procedures necessary for control of humidity and moisture in survival shelters.

37) AD-600437

MOISTURE IN SURVIVAL SHELTERS. :Final Report.

Flanigan, F.N. & Gonzalez, J.O. (Jr.)

April 1964

Abstract: An investigation was made into the sources of and the means of control of moisture in survival shelters. Moisture was found to originate within survival shelters as a result of the metabolic process of the occupants and by evaporation from

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exposed wetted surfaces. The principal modes for introduction of moisture were found to be gross leaks in the shelter structure, vapor migration through permeable walls, and the humidity contribution of the ventilation air. Methods of moisture control included prevention of ingress by improved water and vapor proofing of the exterior shelter surfaces, removal by means of excess ventilation air, and condensation with or without subsequent rejection of the resultant latent heat. No satisfactory methods or devices were found for condensing or absorbing water vapor when the resultant latent heat was liberated within the space to be conditioned. Both theoretical considerations and practical demonstrations indicated that the effective temperature was invariably raised thereby. Methods evaluated included absorption by treated fibers and by chemical agents as well as drying by mechanically powered dehumidification devices. Water coils, employing cool water from constant temperature deep wells, were successful in condensing moisture from shelter atmospheres. Calculations indicate this method to be more efficient than cooling and dehumidification by compression refrigeration. Integral mechanical or chemical dehumidifiers may be employed to produce and maintain satisfactorily low humidity environments in unoccupied shelters only if steady state water leakage and vapor migration can be kept to low levels. Otherwise, shelter and surrounding earth are raised to and maintained at temperature levels prejudicial to survival if the shelter must be used.

38) AD-600751

THE AMERICAN PUBLIC AND THE FALLOUT-SHELTER ISSUE. A NINE-COMMUNITY SURVEY. VOL.II. THE STUDY DESIGN AND THE STUDY COMMUNITIES.

Levine, G.N. & Modell, J.

Oct. 1963.

Abstract: During the winter of 1962 and 1963 a survey was conducted in 9 communities to ascertain the opinions of the general public on the fallout shelter issue. The study design is outlined and descriptions are presented of the communities in which interviews were made. The development of the basic questionnaire used in the interviews is also discussed.

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39) AD-600759

ENVIRONMENTAL INSTRUMENT PACKAGE FOR A CIVIL DEFENSE SHELTER

Thomas A. Edison Research Lab. Div. of McGraw-Edison Co.,
West Orange, N.J.

May 1964.

Abstract: The environmental variables that need monitoring are temperature, relative humidity, differential pressure, and concentrations of various gases. The tolerance levels and instrument design ranges for these variables are outlined. Several instrument packages have been evaluated, and recommendations are given for revisions of existing equipment.

40) AD-602677

VULNERABILITY TO NUCLEAR ATTACK OF THE WATER TRANSPORTATION SYSTEMS OF THE CONTIGUOUS UNITED STATES.

Benjamin, V.A. and Harvey, L.D.

May 1964.

Abstract: An analysis was made of the vulnerability of the U.S. domestic water transportation systems to nuclear attack. The basic analytical procedure was to develop inventory data, assess the damage to the inventory for a range of nuclear attacks, identify those parts of the water transportation systems that appeared most vulnerable to nuclear attack, and suggest means to reduce the vulnerability. This basic procedure was followed for the four major components of the water transportation systems: (1) waterways, (2) vessels, (3) terminals, and (4) personnel. statistical data are provided in the appendixes for each of these components.

(NSA:19:22588)

41) AD-602854

A SUMMARY OF THE FINAL REPORT-FAMILY ADOPTION OF PUBLIC FALLOUT SHELTERS.

Gerald, E.K. et al.

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Abstract: A study was made of how people adopt in idea of using public fallout shelters. Five stages in the adoption process are defined: awareness, information, evaluation, trial and finally adoption. The population in Des Moines was classified into the above stages. The relation of the following factors to the stage of adoption was studied: demographic, knowledge, attitude, and sources of information.

42) AD-603216

LOCAL CIVIL DEFENSE SYSTEMS. A STUDY OF COUNTERFORCE DEFENSE SYSTEMS METHODOLOGY APPLIED TO TUCSON, ARIZONA AND ENVIRONS

Arizona. Univ., Tucson. Engineering Research Lab.

June 1964.

Abstract: Procedures and methodologies necessary to evaluate local nuclear-attack hazards are presented and the results are applied to target cities; specifically, Tucson, Arizona, and environs. The design concepts which have evolved from consideration of conceivable constraints (developed from the evaluations) are presented in general form. Particular concepts which appear to be most realistic, in light of economic factors, are described in greatest detail. Training requirements are outlined for the most desirable concept. Technical material in substantial detail is included.

43) AD-609202

SOME PUBLIC VIEWS ON CIVIL DEFENSE PROGRAMS.

Nehveva, J. et.al.

Dec. 1964.

Abstract: A survey of Civil Defense and Cold War Attitudes was conducted in mid-1963 using a national probability sample of 1,434 Americans. The sample's orientation to civil defense systems and cold war issues was analyzed in terms of relevant

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social and personal characteristics. Interviews dealt with the likelihood and desirability of various alternative shelter systems and cold war outcomes. In addition to the data collected on attitudes and opinions on the central issues, respondents were asked a series of questions specifying pertinent elements of their social and personal attributes. These dealt with such topics as marital status, family income, education, age, etc., and a variety of other questions tapping these dimension. Results indicated young, well-educated people are the best informed.

(NSA:19:32446)

44) AD-611764

REQUIREMENTS FOR LOCAL PLANNING TO COVER HAZARDS OF FALLOUT.
VOLUME I. :Final Report, Vol.1.

Dunlap and Associates, Inc., Darien, Conn.)

Jan. 1965.

Abstract: The development of effective plans for assigning shelters to population, and for bringing the population to the shelter was studied. Two medium-sized towns in Connecticut, Stamford, and Waterbury, were studied in detail. For each town, a study was made on the effectiveness of a number of plans of varying detail and complexity in getting people to shelter. In all plans it was assumed that enough traffic control could be set up to avoid blockages of traffic near shelters, and that the population would know to what shelter to get there. Two types of shelter assignment were made: the first was by census tract, the second by individual location. In the first, people from shelter-poor census tracts were directed to shelter-rich census tracts, according to a linear programming method aimed at minimizing distance traveled. In the second, a similar method was used to assign people to actual buildings. Studies were made of various speeds of movement to shelter and their effects upon rate at which the population was sheltered. Planning problems associated with primary and secondary fires were given cursory examination.

(NSA:19:46635)

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45) AD-611765

REQUIREMENTS FOR LOCAL PLANNING TO COVER THREATS OF FALLOUT.
VOLUME II. APPENDICES. :Final Report, Vol.2.

Dunlap and Associates, Inc., Drien, Conn. .

Jan. 1965.

Abstract: Information is included on: civil defense systems, management planning for shelters, mathematical models for traffic, populations, passenger vehicles, and hazards and distribution of radioactive fallout.

(NSA:19:46636)

46) AD-612254

LABORATORY INVESTIGATIONS OF SHELTER MANAGEMENT FACTORS.

Hale, John F.; et.al.

Jan. 1965.

Abstract: Several shelter exercises were conducted to investigate shelter management factors. The most efficient operation of the shelter occurred when the manager was present from the beginning of the exercise. The effectiveness of operation in the absence of the trained manager depended upon the attitude toward the exercise of the emergent shelter leader, and upon the way in which he employed the in-shelter guidance materials. A management style in which approximately equal attention is given to both technical and non-technical problem areas was much more effective than styles in which more attention is given to one of these areas at the expense of the other. Complete darkness in a shelter was found to be tolerable for 24 hours by a group of volunteers from the research staff of A.I.R. This finding should be viewed, not as a base line, but rather as ceiling. That is, it is very unlikely that a complete shelter naive group would behave nearly as calmly and assuredly as this group.

(NSA:19:46637)

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47) AD-613359

PREDICTION MODELS FOR FIRE SPREAD FOLLOWING NUCLEAR ATTACKS.
:Final Report.

United Research Services, Inc., Burlingame,

Jan. 1965.

Abstract: A semiempirical approach is used to predict fire spread beyond the area directly ignited by thermal radiation from nuclear weapons. Mathematical models, both stochastic and deterministic, describe the progress of fires in two-dimensional or one-dimensional space. Application of each needed for evaluation of parameters are specified and methods for acquiring these data suggested. Observed data, accumulated over many years in records of past fires, have proved valuable in determining some of the parameters. The remaining parameters require further observed data. At present approximate prediction can be made by use of a specially designed version. The results of a statistical study on observed rate of spread data are also presented, and a number of specific problems that must be worked out before the method can be used for assessing the fire damage from nuclear attacks are discussed.

48) AD-614824

BULGUR WAFER AND ADJUNCTS FOR FALLOUT SHELTER RATIONS.
:Annual Report, July 1963 - June 1964.

Shepherd, Allan D. et al.

Jan. 1965.

Abstract: Long-term (five-year) studies of the storage life of bulgur wafers and adjuncts (food to serve with the wafers to vary fallout shelter menus) are in progress. Taste panel results after 16 months of storage indicate that the shelf-life of bulgur wafers may be increased by nitrogen-gas packing and by use of malt sirup rather than corn sirup in the formulation. Chemical-physical analyses are being made on duplicate samples of wafers in a search for a test that correlates with organoleptic evaluation. Tests are not yet well enough developed to permit meaningful correlation. Identity of components of the vapors from rancidifying bulgur and from a model compound, methyl

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linoleate (linoleic acid comprises more than half of the fatty acids in wheat), is being sought by means of a new technique which combines gas-liquid chromatography and rapid-scan mass spectrometry. Wheat products prepared by hot-air puff-drying and by gun puffing were evaluated as wafer ingredients potentially cheaper than regular puffed bulgur. Material obtained by hot-air puff-drying shows some promise as a suitable alternate wheat ingredient for wafers. Several new adjuncts are proposed, including a pectin jelly prepared with cold water to replace the originally developed jellies requiring hot water for preparation.

(NSA:20:2067)

49) AD-614895 (P-3074(RAND)).

THE CHINESE NUCLEAR EXPLOSION, NATION NUCLEAR DEVELOPMENT AND CIVIL DEFENSE.

Zilbert, E.E.

April 1965.

Abstract: The October 1964 explosion of an atomic device by China is reviewed, with thought as to possible similar activities by other countries such as India and Brazil. The United States Government is taken to task for having implemented no fallout shelter program.

(NSA:20:2068)

50) AD-615003

SHELTER OCCUPANCY STUDIES AT THE UNIVERSITY OF GEORGIA.
:Appendices.

Georgia Univ., Athens..

Dec. 1964.

Abstract: From 8-21 February, 1964, a 13-day simulated fallout shelter occupancy test was conducted by the University of Georgia Psychological Laboratories. This test was the fifth in a series of such studies. Its primary purpose was the evaluation

of shelter survival without a trained shelter manager. Other purposes included relative food preference tests, commode chemical tests, and cognitive vigilance tests. Thirty shelterees, 15 females, aged 7-70, participated. Stress conditions included restricted food and water rations, minimal living space (8 ft²/person), a chemical commode, reduced ventilation, and sleeping accommodations of corrugated fiberboard placed over a concrete floor. The shelter manager was appointed, although he received no prior training in management methods or familiarization with shelter material. A shelter Manager Hand-book, with additional instructional material, was stocked with the OCD shelter supplies. The hand-book provided information on use of stocked items, as well as a suggested daily activity and training program.

(NSA:20:2069)

51) AD-615004

SHELTER OCCUPANCY STUDIES AT THE UNIVERSITY OF GEORGIA.
:Final Report.

Harnes, John A.

Dec. 1964.

Abstract: From 1962-1964 the University of Georgia conducted six simulated community fallout shelter occupancy tests for the Office of Civil Defense. Investigated variables included organizational and environmental factors. Men, women, and children, aged 3-70 years, participated. Recent test results and overall implications for the National Shelter Program are reported.

(NSA:20:2070)

52) AD-615005

SHELTER OCCUPANCY STUDIES AT THE UNIVERSITY OF GEORGIA.
:Final Summary Report.

Harnes, John A.

Dec. 1964.

Abstract: Results of occupancy tests on simulated community fallout shelters are discussed. Information is included on personnel

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management, leadership, sanitary engineering, sleep, temperature, food, water, physical fitness, ventilation, personality, and environmental and physiological stress.

(NSA:20:2071)

53) AD-619902

FALLOUT MODELS AND RADIOLICAL COUNTERMEASURE EVALUATIONS.

Miller, Carl F.

Abstract: A fallout model and other submodels are described that have been formulated to assist in the assessment of radiological defense problems and in the evaluation of radiological countermeasures. The design of the model system emphasizes application of both short-term and long-term radiological problems of interest to civil defense. The types of input data that are utilized, the various important independent parameters that are considered in the models and submodels, and the types of output information are listed. Also, the major assumptions, constraints, and concepts involved in the mathematical construction of each model are summarized. The purpose of the report is to provide researchers on other civil defense investigations general background information on the composition and outputs of these models. The report does not include any of the mathematical formulations of the models.

(NSA:19:44243)

54) AD-621377

THERMAL TRANSIENT RESPONSE OF UNDERGROUND SHELTERS.

Sampsell, D.F.

Abstract: To gain insight into the transient response of underground shelters, a series of test using a scale model shelter was conducted. Model-prototype considerations resulted in several model temperature distortion which could be accounted for by analytical techniques. The corrected model results agreed well with results from an analog computer study which considered the same proto-type shelter. The model results also indicated that shelter shape does not significantly affect its

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transient response. Another phase of this study was the development of a noncomputer design procedure for determining the environmental control system capacity required for a given set of climatic and soil conditions. The design procedure was applied to a number of shelter locations and climatic conditions to test its performance. As expected, the solutions indicated that ventilation rate and air-conditioning capacity depend heavily on climate, initial soil temperature, and shelter area per person. A record of the analytical and experimental methods evolved under the task to date is presented. All analytical and experimental techniques are described in detail, and numerical examples for a typical model run and design procedure solution are given.

(NSA:20:20920)

55) AD-621998

VENTILATION OF FALLOUT SHELTERS BY INDUCED DRAFT.

Whitehill, C.F. et al.

Period covered, July 1964 - June 1965.

Abstract: It is demonstrated that a minimum air rate can be obtained in home shelters by inducing draft in the exhaust stack by means of a flame from a kerosene burner which can simultaneously provide illumination. The ventilation test procedure included inducing air to flow through the shelter, determining the actual cubic feet per minute of air flowing, measuring air temperatures at inlet, room, and stack, measuring the pressure drop or restriction to air flow at the shelter inlet, and finding the effects of various stack sizes and configurations upon air flow rates. Data were also taken to determine the effects of various stack sizes and configurations on the fuel consumption of the heating devices. Ventilation of family-type shelters by the induced draft method is effective and reliable if the following conditions are observed: wind velocities around the stack outlet are kept to a minimum or a good ventilator stack cap is used; filters are not used at the shelter inlet (air taken from body of house); and the intake area of shelter is much larger than the cross-sectional area of the stack.

(NSA:20:20921)

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56) AD-622333 (SUM-65-1)

TRAJECTORY ANALYSIS FOR STRUCTURAL FRAGMENTS. :Addendum to Final Report. DEbris CLEARANCE STUDY.

Ahlers, Edward B.

Aug. 1965.

Abstract: Trajectories of structural fragments subject to nuclear blast winds are analyzed. Trajectory computations are made for spherical masonry fragments, and are compiled for the following range of parameters: 2- to 24-in. dia fragments, initial fragment elevations from grade to 280 ft above grade, nuclear weapon yields 100 kt to 50 Mt, and peak overpressures 7 to 250 psi.

(NSA:20:3610)

57) AD-624701 (R-OU-157(Vol.1)).

SENSITIVITY ANALYSIS OF CIVIL DEFENSE SYSTEMS AND COMPONENTS. A COST-EFFECTIVENESS COMPUTER PROCEDURE FOR OPTIMUM ALLOCATION OF FALLOUT SHELTER SYSTEM FUND UNDER UNIFORM OR VARIABLE RISK ASSUMPTIONS. :Final Report, Vol.1.

Guess, Floyd M.

Oct. 1965.

Abstract: The dynamics of civil defense planning and systems evaluation require a procedure that yields approximate answers to questions concerning effective fallout shelter improvement programs. To accomplish this, a computerized model for the CDC 3600 is developed and is demonstrated for OCS Region 6. The model permits an evaluation of shelter improvement programs against any fallout environment, but it is particularly valuable when RISK-type expressions of the probable fallout environment are used as inputs. Using detailed data from the National Fallout Shelter Survey and equally detailed estimates of the probable fallout hazard in a small area (counties, in the demonstration), the extent to which an area's population is inadequately protected is determined. Fallout shelter system funds are then allocated to areas of need in an optimal manner. The

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allocation employs shelter cost data obtained from Phase 2 of the National Fallout Shelter Survey on ventilation and shielding improvements. Estimated costs for package ventilation and shelter in new construction are also employed in the demonstration in OCD Region 6. In all, 11 cost studies are run, using selected combinations of the budget level, the fallout risk level, etc.

(NSA:20:23264)

58) AD-624702

A SENSITIVITY ANALYSIS OF SELECTED PARAMETERS BASED ON 8 SMSA'S.
:Final Report, Vol. 2.

Sink, H. Rodney

Oct. 1965.

Abstract: In order to perform a sensitivity analysis of selected parameters of interest in Civil Defense systems analysis, probable casualties are estimated for 8 SMSA's over a range of fallout environments and shelter utilization patterns. The selected parameters are: SMSA population, population density, and ratio of shelter spaces to population; fallout arrival time and reference intensity; and restrictions on movement of people to shelter, leading to varying patterns of shelter utilization. The SMSA's are selected by "judgment sampling" and range in population from 74,000. The fallout environments used range from a reference intensity of 600 r/hr and 7 hours time of arrival to a reference intensity of 30,000 r/hr and 1 hour time of arrival. The movement-to-shelter restrictions are: movement restricted to the Standard Location (SL) of residence, movement restricted to within two miles of the SL of residence, and unrestricted movement to shelter anywhere within the SMSA. Also, the transportation algorithm is used to determine the optimal (minimum casualty) allocation of people to shelter for each time of arrival and reference intensity combination. This allocation serves as a benchmark of ideality against which to measure other patterns of shelter utilization. Casualties are computed for each of the four movement patterns over the range of attack environments.

(NSA:20:23265)

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59) AD-624703 (D-OU-157(Vol.3)).

SENSITIVITY ANALYSIS OF CIVIL DEFENSE SYSTEMS AND COMPONENTS.
1. GENERALIZED SENSITIVITY ANALYSIS OF CD SYSTEMS.
:Final Report, Vol.3.

Neblett, John H. and Willis, Kenneth E.

Oct. 1965.

Abstract: This sensitivity analysis employs mathematical models which estimate the total dose, maximum RDD, and probability of casualty or fatality for an individual exposed to a particular radiological environment. The objective of the analysis is to determine the relative importance of the parameters normally employed in evaluating Civil Defense systems i.e., to determine those parameters which, through large variance or inaccurate estimates, will contribute most to erroneous evaluations of CD systems.

(NSA:20:23266)

60) AD-624870

TRAINING REQUIREMENTS FOR POSTATTACK ADAPTIVE BEHAVIOR.
:Final Report.

Teal, Gilbert E. et al.

Dec. 1965.

Abstract: The study is aimed at identifying actions required of and beneficial to individuals in a post-attack environment and developing guidelines concerning content and methods of training that would generate adaptive behavior. Methods of study were limited to literature review and scientific argument. Two major training objectives are specified: training to meet the requirements of individual survival; and of societal recovery. It is recommended that training materials be stocked in public shelters to support these objectives. It is also recommended that certain information basic to education of the public in emergency measures be prepared for timely use in mass communication media at such times as crises or disasters provided the essential motivation to learn. It is suggested that training is the responsibility mainly of local community political authority.

(NSA:20:23338)

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61) AD-625867

FEUSABILITY OF BUILDINGS AFTER WARFIRE. :Final Report.

Troxell, G.E. et al.

Jan. 1964.

Abstract: A method for the calculation of a fire resistance rating by utilizing an electronic computer program is reported. The evaluation is divided into two parts; the resistance to interior exposure and the susceptibility to exterior exposure. Resistance to interior exposure is rated by estimating the probable severity of interior fire, assuming ignition of combustible contents, then combining this estimate with the fire resistance and economic value of the building. The reduced economic value, which is calculated as a percentile, is referred to as the Building Reusability Index (BRI). Susceptibility to exterior exposure is evaluated in terms of an Exposure Protection Index (EPI). The rating system was prepared assuming no fire fighting or public utilities were available.

(NSA:20:16621)

62) AD-626831 (N-756)

BLAST RESISTANCE OF CHECK AND GATE VALVES

Bockman, K.R. et al.

Nov. 1965

Abstract: The objective of this task was to determine the blast resistance of standard check and gate valves which may be used in protective shelter equipment and utility systems. To accomplish this objective, commercially available 3 inch 200 psi WOG (water, oil, or gas) bronze check and gate valves were subjected to transient air pressures to about 390 psi (the maximum capability of the Laboratory at the time of the tests) and to transient hydraulic pressures to about 2000 psi. Subsequent visual examination, operational tests, and hydrostatic leak tests revealed no damage to the valves, and test data indicated relatively low magnitudes of strain. Which leads to the conclusion that standard check and gate valves can withstand transient loads far in excess of their rated capacity. In order to determine whether or not the valves may be dynamically loaded when subjected to a

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nuclear blast wave, the natural frequencies of the valves were obtained and compared to the rise time of nuclear explosions. This showed that if a blast wave reaches the valve without attenuation, dynamic loading could occur. If however, the wave must propagate through a piping system to reach the valve, the wave front may be relatively unchanged, or it may steepen and possibly increase the dynamic loading, or it may be attenuated so that little or no dynamic loading would occur. In the case of shocks generated by the test equipment. It was shown that dynamic loading was not applied. Because the most severe loading conditions could not be produced by the test equipment, the exact configuration in which valves are to be used must be considered before recommendations can be made as to their blast resistance.

63) AD-626770 (TR-170)

AN INVESTIGATION OF SCHOOL DESIGNS TO RESIST INTEGRATED NUCLEAR WEAPONS EFFECTS. Final Technical Report,

Bruce, Robert N. Jr. et al.

1965.

Abstract: A comprehensive study was made on the capabilities of the award winning entries of the National School Fallout Shelter Design Competition, TR-19, to provide protection against effects of nuclear weapons other than those that are associated with fallout. Specific areas of investigation included: an examination and evaluation of the winning designs to ascertain their bonus protection and inherent resistance to withstand thermal radiation, overpressure, and dynamic pressure; a tabulation of advantages and disadvantages of each design, as applicable; recommendations for appropriate design modifications; and a tabulation of costs for the recommended modifications.

(NSA:20:20868)

64) AD-627516

DESIGN PROCEDURES FOR SHOCK ISOLATIONS SYSTEMS OF UNDERGROUND PROTECTIVE STRUCTURES. VOLUME V. RESPONSE SPECTRA OF MULTI-DEGREE-OF-FREEDOM ELASTIC SYSTEMS.

Period Covered , November 1963 - January 1965.

Newmark, N.M. et al.

Dec. 1965.

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Abstract: A discussion is presented on maximum response for multi-degree-of-freedom elastic systems considering five-degree-of-freedom systems in some detail, with some results for ten-degree-of-freedom systems and other systems for which data are available in the literature. Included are tabulations of response data computed from step by step integration of the equations of motion for five different forms of ground excitation on a number of systems having varying parameters of mass and stiffness distribution. The results are compared with the modal responses for the same systems, and general rules are developed for comparing the true responses with various combinations of the modal response data. Consideration is given to treatment of a multi-degree-of-freedom system as a continuous shear beam, and some generalizations are drawn from the study which enable a better interpretation of the results of the specific data tabulated. Some suggestions arising from previous studies are made to take into account the behavior of multi-degree-of-freedom systems in the inelastic range.

(NSA:20:23342)

65) AD-629633 (GARD-1244)

SHELTER PACKAGE VENTILATION KIT. :Final Report.

Libovitz, Basil, A. & Behls, Herman F.

Oct. 1965.

Abstract: A portable ventilation system that can be driven manually or by an electric motor was developed for use in Civil Defense fallout shelters. This package ventilation kit includes a fan assembly and drive modules which can be assembled and operated by untrained personnel.

66) AD-629784

RADIOLOGICAL TARGET ANALYSIS PROCEDURES.

Lee, Hong

Mar. 1966.

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Abstract: A radiological target analysis procedure is presented which provides calculations of the relative exposure intensities within target complexes during the shelter period, the decontamination period, and the target reutilization.

(NSA:20:18938)

67) AD-629914

INTEGRATED GUIDANCE FOR SHELTER MANAGEMENT. THE SELECTION AND RECRUITMENT OF SHELTER MANAGERS.

Smith, Robert T.; Jaffreys, Frank B.

June 1965.

Abstract: The development, field-verification, and revision of guidance materials for the selection and recruitment of shelter managers suitable for use by local civil defense personnel was the purpose of the project. The scope of existing guidance was reduced by eliminating both the training guidance and the discussion of the supporting methodology. A sample of ten representative communities was selected to use the guidance to implement a selection and recruitment program. Data collected included: previous selection and recruitment efforts, comments on the materials effectiveness of selection and recruitment programs implementing the guidance, and information on the community. Although response to the principles was favorable, considerable difficulty was encountered in convincing the local civil defense personnel to use personal contact in selection and recruitment. In those communities where the guidance was applied, the results indicated that the Guide's recommended methods are superior to the more traditional method of general requests for volunteers. Further verification of the guidance was gained from observing a pilot recruitment program conducted by Region, state, and local civil defense workers in a Western city.

(NSA:21:8778)

68) AD-629928

DETERMINATION OF SHELTER CONFIGURATION FOR VENTILATION.
:Summary of Final Report.

Hill, Edward L. et al.

July 1965.

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Abstract: In Phase 1 of the National Fallout Shelter Survey (NFSS), all buildings in the United States, except single family dwellings thought to have a protection factor (PF) of 20 or more and space to shelter 50 or more people were surveyed. Based on the results of the Phase 1 survey, contractors subsequently in Phase 2 of the NFSS evaluated designated facilities to determine the feasibility and cost of: (1) increasing shielding to provide a prescribed minimum protection factor; (2) improving habitability to meet minimum specifications; and (3) increasing shelter capacity. Shelters deemed acceptable also were marked with fallout shelter signs in Phase 2. Approximately 73 million shelter spaces had been marked by April, 1965.

(NSA:21:8779)

69) AD-631420

VENTILATION TESTS OF FALLOUT SHELTER SPACES IN NEW YORK CITY AND VICINITY. Final Report.

Combe, Michael A. et al.

Feb. 1966.

Abstract: Natural and forced ventilation tests were conducted during 1964 at eight shelter sites. Included were: three (summer) tests in high-rise building core areas; two (summer) tests in public school corridors and basements; one (summer) test in a home basement; one (summer) test in a buried community shelter; one (winter) test in a buried private shelter. Using electro-mechanical 'Simocs' to simulate shelter occupancy, the resulting physical environment was measured and analyzed. Manual ventilation devices and water-cooled heat exchangers were developed and tested to determine their ability to provide a more tolerable shelter environment. Formulas for predicting shelter ventilation and temperatures are discussed. Methods for improving ventilation rate are suggested. The report concludes that effective temperature (ET) in naturally ventilated above-ground shelters (loading; one person/10 sq.ft.) will not exceed 85F with outside air at N.Y.C.15/ summer design level. In naturally ventilated buried or semi-buried shelters (one person/10 sq.ft.) ET may exceed 85F at same design level. During normal winter weather (Conn.), naturally ventilated underground

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shelters with efficient heat sinks will have uncomfortably low ET (40F-50F), if loaded with fewer than one person/10 sq.ft. Radiant reflective insulating paper is found to increase ET by 10-15F while preserving the heat sink.

(NSA:21:8781)

70) AD-632211 (USNEDL-Tech-5; URS-646-4)

OPERATIONAL AND MANAGEMENT ASPECTS OF PERIPHERAL RADIOLOGICAL
COUNT MEASURES. :Final Report.

Van Horn, William H.

Mar. 1966.

Abstract: The four peripheral countermeasures studied, postattack evacuation, applied shielding, dose equalization (including group shielding), and exposure scheduling, can be used by the local civil defense organization to provide a significant degree of control over radiation exposure during the early postattack period resulting in the reduction of dose to personnel and/or the time of emergence from shelter. Operational constraints on the implementation of peripheral countermeasures can be lessened by a limited preattack planning effort on the part of the local civil defense organization. Such planning includes recognition of postattack demands for peripheral countermeasures and the probable response capability. Postattack implementation of peripheral countermeasures, although optimized by preattack planning, can be accomplished using planning aids and procedures, developed in the report, which permit the rapid evaluation of available inputs. These aids emphasize predicting dose (both accumulated dose and equivalent residual dose) for complex radiological environments. Response time, which is a major management constraint, can best be minimized by delegating authority for local action to the lowest echelon, normally the shelter itself. It is concluded that the planning necessary for the use of peripheral countermeasures can be integrated into the present civil defense organization with relatively minor difficulty, resulting in an appreciable payoff in postattack capabilities.

(NSA:2041177)

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71) AD-632351

FURTHER STUDIES ON THE DEVELOPMENT OF NUTRITIONALLY ADEQUATE
FALLOUT SHELTER RATION. :Final Report, Pt.1. March 25, 1964-
March 31, 1966.

Newlin, Harrison E; Hayes, Gene L.

Abstract: Nutritional supplements were developed for consumption with presently available shelter rations. When consumed as directed, these supplements will supply all the nutritional factors recognized by the National Research Council as essential for the maintenance of adults. They will extended the use of shelter rations to shelter occupants who require special feeding, and to the general population, during the post-attack period. The supplements are of two types: unflavored compressed tablets; and dehydrated spreads, flavored so that they will enhance the palatability of ration biscuit, cracker, and wafer. Accelerated storage tests indicate that (a) the tablets have a high expected shelf life, and (b) the flavor of the spreads should be further stabilized. New mint-type and tableted granular starch carbohydrate supplements were developed, which are soft-textured and fully compatible with the mucous membranes of the oral cavity.

(NSA:21:8783)

72) AD-632560

EFFECTS OF NUCLEAR ATTACK ON RAIL ACTIVITY CENTERS.

Jones, Paul S.

July 1961.

Abstract: The work reported is the result of an analysis of post-nuclear-attack railroad operation in 12 rail activity centers. The analysis has been based upon the transportation of a single commodity **food**. The selected nuclear attack involved 3754-megaton weapons directed against retaliatory bases and industrial and population centers. The determination of post-attack food transportation requirements was based on the number and location of survivors by country, or similar divisions, and the geographical configuration of surviving yards and rail lines. Interstate food shipments were traced from the point where each rail activity center would be entered to points within 5 or 10 miles of survivors. Supply routes were selected by which food deliveries could

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be economically made to all survivors and empty freight cars removed. Traffic patterns were established together with yards assignments and requirements for rolling stock. The capability of the rail facilities to accommodate additional traffic was also determined.

(NSA:21:8784)

- 73) AD-632595
REVIEW OF COMBINED TRAUMA RESEARCH. CLINICAL MANAGEMENT, AND
PLANNING.

Williams, Dean W.

Jan. 1966.

Abstract: The review cover the topic of combined trauma including radiation injury plus burns, physical injury, and/or infection, since this class of casualty is almost exclusively the product of nuclear weapons effects, the emphasis of the review is on principles of clinical management. Major sections of the review include a casualty model, generated to assess the significance of combined trauma relative to other forms of injury; a review of clinical management principles for care of combined trauma patients; clinical guides to the care of radiation, burn, and infection casualties; a review of the recent combined trauma research; and a summary of planning measures designed to assist in preparedness for disaster medical are all extensive bibliography is also included.

(NSA:21:39440)

- 74) AD-632865 (R-OU-127)

ENVIRONMENTAL HEALTH PLANNING FOR POSTATTACK CONDITIONS:
SOME PROBLEMS, PROGRAMS, AND PRIORITIES. :Final Report.

Salmon, Raphael J.

April 1966.

Abstract: A framework to help decision-makers evaluate postattack conditions relative to environmental health was developed. Review and analysis of existing information on probable postattack conditions as they might effect, and be affected by personnel of local health departments, public health organizations, and resource management practices is presented. Anticipated postattack environmental health problems are identified, and priority jud-

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gments are made on a comparative basis in terms of level of gravity. Rationale supporting the judgments is included, and both action research programs to improve preparedness are recommended. Four city health departments were visited to assist in analysis of normal environmental health conditions relative to those expected in a post-agency to cope with projected conditions.

(NSA:20:27184)

75) AD-632963

PREPRODUCTION PROTOTYPE PACKAGE VENTILATION KIT, SECOND
STRUCTURAL AND HUMAN FACTORS TEST. :Final Report.

Basil, Libovicz, et al.

August 1965.

Abstract: A portable ventilation system, designed for fallout shelters, was manually operated continuously for two weeks. The package Ventilation Kit (PVK) evaluated included a Fan Assembly plus two Drive Modules. A previous test had disclosed some mechanical weaknesses that were subsequently changed. The modified PVK functioned without any failure; therefore, specification MIL-V-40645, 'Package Ventilation Kit, 20-Inch Fan, Modular Drive (Civil Defense). was issued 16 August 1965. Minor improvements to this specification are recommended.

76) AD-632364 (GARD-1278-2)

FRICTION LOSS IN FLEXIBLE PLASTIC AIR DUCT

Neveril, Robert B. & Behls, Herman F.

Oct. 1965.

Abstract: Tests were conducted to determine the pressure drop-characteristics of 20-inch diameter, 4-mil thick, polyethylene tubing and both factory and shelter fabricated 90-degree elbows. The tests were performed at flow rates ranging from 1300 to 4100 cubic feet per minute. These plastic components are part of a portable ventilation system that was developed for civil defense fallout shelters, specification MIL-V-40645. Fully inflated 20-inch diameter plastic tubing has about three quarters of the

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pressure drop of sheet metal duct. However, the last fifty feet of a plastic duct system, which is not completely inflated, has 1-1/2 to 3 times the pressure drop per foot of fully inflated plastic tubing. The result is that for duct systems over 100 feet long the pressure drops for sheet metal and plastic tubing are approximately the same. The friction losses for both factory fabricated and shelter fabricated elbows were established. A 40-inch, smooth radius, 90-degree factory fabricated elbow is recommended for use with the Civil Defense package ventilation kit. This elbow develops a pressure drop equivalent to 50 feet of straight tubing. The best shelter fabricated elbow is a three-piece elbow with a radius of 60 inches that can be fabricated from the straight tubing and tape stocked in the package ventilation kit. This elbow develops a pressure drop equivalent to 30 feet of straight tubing.

77) AD-632989 (NDM-TR-66)

DECONTAMINATION OF LAND TARGETS, VEHICLES, AND EQUIPMENT.

Maloney, J.C. and Meredith, J.L.

May 1966.

Abstract: Decontamination experiments on exterior surfaces made radioactive with small-particle simulant, and decontamination studies on railroad tracks, transportation vehicles, and mechanical equipment used for radiological recovery operations are described. Approximately 150 decontamination trials were conducted at Camp McCoy, Wisconsin, during 1961 and 1965. Standard reclamation techniques when applied to 20- to 75- μ fallout on land targets were found to be less effective than when applied to larger particle ranges. The reclamation techniques of air and water housing were of limited effectiveness when applied to railroad track areas. The passage of fast trains can be expected to effectively remove fallout from the track area under the train. Vehicles and equipment contaminated with fallout are effectively decontaminated by dry manual and airhousing procedures, and in some cases, by weathering effects. First-echelon effort with a broom was adequate and reasonable. The presence or use of water, especially in below-freezing weather, can adversely affect the decontamination of vehicles and equipment.

(NSA:20:27185)

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78) AD-633233

EXPERIMENTAL PROTOTYPE SHELTER VENTILATION KIT, FILST
STRUCTURAL AND HUMAN FACTORS TEST. :Interim Report No. 29.

Bazil, Liboviz A

May 1965.

Abstract: A structural test and human limit evaluation of the shelter package Ventilation Kit (PVK) showed that the ventilator can be readily operated for periods of at least three hours with 7 minutes rest each half-hour. The PVK can be operated at pedal speeds from 45 to 63 RPM and the preferred speed was 55 RPM. The optimum power input was found to be 0.10 horsepower per operator, and the maximum tested was 0.15. Most tests were performed at comfortable conditions, 68 to 72°F effective temperature (ET). The maximum ET imposed was 83 F. Further tests are required to establish work/rest cycles when operating the PVK at elevated ET's.

(NSA:21:633233)

79) AD-634040

DEVELOPMENT OF AN AUTOMATIC REMOTE RADIATION MONITORING (ARRM)
SYSTEM. :Final Engineering Report.

Fox, Stewart A

Dec. 1965.

Abstract: Engineering and performance data on a prototype remote automatic monitoring system designed for use in local emergency operating centers are reported. The development effort included, but was not limited to, design and construction of a detection system which transmits digital radiation data on command from a remote monitor location; incorporation of sensor station identification for serial line systems; production of one complete sensor station system for field evaluation. The system described will transmit data over commercial telephone lines and provide control for operation of radio frequency communication equipment. An investigation of data storage and retransmission systems was performed.

(NSA:21:8573)

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80) AD-635250

THERMAL HARDENING CONSIDERATIONS PERTAINING TO RESIDENTIAL AREAS.

William, Parker J.

July, 1966.

Abstract: The incendiary effects of thermal radiation from nuclear weapons on residential areas are considered. It is included that a hazard does exist and that the most desirable means of protection is to make the exposed materials ignition resistant. This has the benefit of providing fire protection in peace-time as well as in war and has a better chance of public acceptance. While some fireproof fabrics and flame retardant treatments for cotton and other materials are now available, there are drawbacks which hinder their universal acceptance. The development of new and improved methods of treatment depends upon an improved knowledge of the mechanisms of pyrolysis and ignition and a more fundamental understanding of the action of effective retardants. A discussion of some of the features of pyrolysis, and ignition of cellulose and the action of flame retardants that are of importance in the thermal hardening problem is presented. Some experiments which may help to elucidate these processes are suggested. It is recommended that various fire retardants, halogen flame inhibitors, preheating treatments, and exposure to ionizing radiation be evaluated in terms of the protection that they might provide against the thermal radiation from nuclear weapons.

81) AD-635501

SHELTER OCCUPANCY STUDIES AT THE UNIVERSITY OF GEORGIA.
:Final Report.

John Hammes, A

Dec. 1965.

Abstract: Results are summarized from two 300-person shelter occupancy test conducted during 1965. Participants were men, women, and children, aged 1 to 70 years. Data are presented on environmental conditions and the psychological adjustment of the group to shelter conditions. The training program for shelter managers is also discussed.

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82) AD-635820 (UXNRL-TRC-16(Summary))

RADIOLOGICAL RECOVERY REQUIREMENTS, STRUCTURES, AND OPERATIONS
RESEARCH. INTRODUCTION AND SUMMARY. :Final Report.

Ryan, Joseph T.

June 1966.

Abstract: The primary objective of this study was to determine cost and effectiveness information relating to the application of decontamination and the extent of its utility when applied to the recovery of extensive city areas in a postattack environment. The general approach toward meeting the objectives of the study, including a brief description of each of the models developed under the contract, is outlined. The command and control aspects of municipal decontamination are summarized, and the results of a systems analysis of decontamination are briefly stated. The results of the extensive real-cities analyses conducted under the subtask are summarized. Both general and specific conclusions and recommendations are stated. The results of the real-cities analyses showed that roof decontamination is an important part of most combined strategies of decontamination. These results also showed that the recovery of substantial city areas and multi-building complexes could be accelerated appreciably by practicable decontamination procedures.

(NSA:20:43567)

83) AD-635821 (USNRL-TRC-16 (Vol.1))

RADIOLOGICAL RECOVERY REQUIREMENTS, STRUCTURES, AND OPERATIONS
RESEARCH. VOLUME I. GENERAL CONSIDERATIONS. :Final Report.

Ryan, J.T. et al.

June 1966.

Abstract: The application of decontamination strategies to extensive urban areas is discussed. Urban areas of various sizes (from a few acres to an interconnected system involving hundreds of acres) are examined with regard to decontaminating vital sections and their connecting links. The task of creating decontaminated islands of marshaling areas is determined to be feasible.

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The nature and scope of command and control system elements required for conducting effective decontamination in practical situations is determined together with the preattack and post-attack data required by such a system. Several models were developed and are discussed.

(NSA:20:41179)

84) AD-635822 (USNEDL-TRC-16 (Vol.2))

RADIOLOGICAL RECOVERY REQUIREMENTS, STRUCTURES, AND OPERATIONS RESEARCH. VOLUME II. DEVELOPMENT OF ANALYTICAL, COMPUTER, AND SYSTEMS MODELS IN SUPPORT OF DECONTAMINATION ANALYSES.

:Final Report.

Ryan, J.T. and Johnson, T.

June 1966.

Abstract: The cost and effectiveness of the radiological decontamination of urban areas in the event of radiological warfare were analyzed. Analytical, computer, and systems models used in the analysis are presented. These include models for approximating gamma ray intensity at a single detector location, a feasibility study of the application of analog computers to the analysis of decontamination, a FORTRAN program for decontamination analysis, and study of the nature and scope of command and control systems required for conducting effective decontamination in municipalities.

(NSA:20:41180)

85) AD-635823 (USNEDL-TRC-16 (Vol.3))

RADIOLOGICAL RECOVERY REQUIREMENTS, STRUCTURES, AND OPERATIONS RESEARCH. VOLUME III. DECONTAMINATION ANALYSIS OF SELECTED SITES AND FACILITIES IN SAN JOSE, CALIFORNIA...:Final Report.

Walker, S.M.

Abstract: The cost and effectiveness of the radiological decontamination of urban areas in the event of radiological warfare were analyzed. Sixteen sites and facilities located in San Jose, California, were selected for study. Facilities decontaminated include a telephone company, a pharmaceutical laboratory, a bus depot, a newspaper office, and the like. Supporting data related to the decontamination analysis are presented.

(NSA:20:41181)

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86) AD-635824 (USNRDL-TRC-16 (Vol 4))

RADIOLOGICAL RECOVERY REQUIREMENTS, STRUCTURES, AND OPERATIONS RESEARCH. VOLUME IV. DECONTAMINATION ANALYSIS OF SELECTED SITES AND FACILITIES IN DETROIT, MICHIGAN. :Final Report.

Ryan, J.T.

June 1966.

Abstract: The cost and effectiveness of the radiological decontamination of urban areas in the event of radiological warfare were analyzed. Twelve sites and facilities located in Detroit, Michigan, were selected for study. Facilities decontaminated include a hospital, department store, water pumping station, a power plant, an airport, a public building, and the like. Supporting data related to the decontamination analysis are presented.

(NSA:20:41182)

87) AD-635930

ALTERNATIVE APPROACHES TO FINANCING A NATION-WIDE SHELTER PROGRAM. A Contributing Investigation to the Area-wide Shelter Systems Study.

Harvey, Ernest C.

Jan. 1964.

Abstract: Results are presented from a preliminary examination of alternative approaches to the problem of financing a nationwide shelter system. Current practices applicable to capital investments by individuals and other segments of the private sector are discussed, some of the problems with respect to their utilization for shelter construction are listed, and incentive programs which could encourage action in this area are analyzed. In addition, local sources of funds and state and federal aid programs are discussed as a basis for evaluating the extent to which each of these levels government could participate. With respect to federal and state programs, particular attention is given to the possibility of combining civil defense considerations with existing program objectives and to the identification of techniques that might be applicable to a separate national program designed to

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develop shelter capability. In general, all approaches other than one involving 100 percent federal funding appear to offer limited potential. However, several aspects of the financing problem warrant additional research prior to a national-level decision regarding financing.

(NSA:20:45938)

88) AD-635931

AREA-WIDE SHELTER SYSTEMS.

Condit, Richard I.

Dec. 1965.

Abstract: "Any reports of previous research describe particular aspects of civil defense, such as identifying fallout protection in existing buildings, designing new blast shelters, providing warning, ensuring emergency communications, etc. - detailed considerations of restricted subject areas. This report is broader in nature, combines such particularized results, and shows how the people of a region may make integrated arrangements for community protection-how they may develop area-wide shelter system. It describes the general principles of community-wide protection, while applying them specifically to the City of San Jose, California. Based on the knowledge of what it takes to provide various degrees of protection from the effects of nearby and distant nuclear explosions, the planning of area-wide shelter systems starts with an inventory of the existing community resources of possible value for protection. In San Jose, this includes the results of the National Fallout Shelter Survey, improving those spaces with additional ventilation, and upgrading them against blast and fire; home basements; special facilities; covered storm drains; and the protection potential of creeks and standing water. To these are added the possibilities for new construction, stretching from emergency trenches and fox holes to carefully prepared blast and fallout shelters. Eight area-wide shelter systems are worked out and presented for San Jose-four for protection against direct effects and fallout, and four for protection against radio-active fallout only. Both sets of four attempt to span the range of possibilities from doing the best you can with what you have, to building a new system to fit the needs. Accompanying procedures for increasing emergency-readiness in case of a warning rise in international tensions are also indicated.

(NSA:20:41183)

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89) AD-636787

A COMPARISON OF THEORY AND EXPERIMENT FOR SHIELDING BY A
STRUCTURE AGAINST FALLOUT RADIATION. :Report No.1.

Preiss, K. and Chilton, A.B.

June 1966.

Abstract: A comparison was made between experiment and theory for the calculation of the shielding properties of a structure against fallout radiation. Experimental results for exposure penetrating a roof slab, and for reduction factor, were found to agree with moments theory calculations, often to better than 10% when the geometry factor $L_3(w,X)$ was used. A comparison between experiment and theory may be inaccurate due to anisotropy of the experimental source to lack of source reflection in roof experiments and due to error in estimating the thickness of the roof. The magnitudes of the errors due to these effects were investigated, and found to be small, but not necessarily negligible. Detailed results of penetration in iron and concrete, due to plane isotropic sources of various energies, are given and a review of ground contribution to fallout radiation penetration through simple structures is appended.

(NSA:20:43568)

90) AD-636794

PRELIMINARY INVESTIGATION OF FIRESTORM START-CRITERIA.

Lormasson, T.E.

June 1965.

Abstract: A quantitative hypothesis is developed that relates inrush wind velocity at the edge of a potential firestorm area to the energy release rate of fires within the area and to the size of the area itself. The effects of spread from initial fires are considered and criteria are derived to estimate the way in which the fires are likely to develop with time. The hypothesis was applied to German World War II fire-storm and group fire situations and appears to yield reasonable results in predicting the occurrences of each. The hypothesis may be applied to nuclear attacks against urban target areas.

(NSA:20:36995)

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91) AD-636947

INDUSTRIAL RECOVERY TECHNIQUES.

Brown, Stephen L.

April 1966.

Abstract: Presented are some generalized concepts concerning industrial models, industrial vulnerability to nuclear weapons effects, industrial recovery requirements, and industrial recovery procedures. Mathematical expressions relating manufacturing outputs to inputs of materials, of facilities, and of people are presented and used to develop measures of damage and guidelines for allocating recovery resources. More qualitative descriptions of industrial operational organization, damage assessment methods, methods for determining recovery requirements, and specific recovery procedures are also formulated. Recommendations are submitted concerning (1) operational countermeasures for industry and for civil defense organizations and (2) desirable further research efforts in industrial civil defense.

(NSA:20:39146)

92) AD-637767

DATA PROCESSING FOR LOCAL CIVIL DEFENSE: AN INVESTIGATION OF THE POTENTIALS

Cusack, B. L.

May 1966.

Abstract: An investigation was made of the potential applications of electronic data-processing-equipment for local civil defense functions. Directed specifically toward the viewpoint of the local civil defense director, the report presents the system considerations required to determine the time period(s) during which such equipments should be used; poses questions, gives answers and discusses the range of potential applications, the constraints and considerations of information systems and managements and operational factors, and, finally recommends the course of action to follow regarding further related studies.

(NSA:21:6483)

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93) AD-639594

PRELIMINARY INFRARED FIRE MAPPING SYSTEMS ANALYSIS :Final Report.

Mikelonis, Eugene C. et al.

Nov. 1965.

Abstract: An analysis is presented of the factors affecting operational use of a post-attack IR fire mapping system. Organizations that could support such an operation were determined. Based upon the employment of a specific number of IR units, the time to map all areas of interest was calculated. A "threat indifference" approach was employed to determine the areas of interest. A training program is presented for both system operators and technical personnel. Many potential peacetime applications of the system were defined. A cost analysis of the various system configurations is also given.

(NSA:20:45939)

94) AD-639710

A PROTOTYPE MANUAL ON CIVIL DEFENSE ASPECTS OF WATERWORKS OPERATIONS, CONSIDERING RADIOLOGICAL RECOVERY PROCEDURES, ALTERNATE DISTRIBUTION TECHNIQUES FOR SAVING WATER, AND ANALYSIS OF BLAST VULNERABILITY OF SELECTED DISTRIBUTION SYSTEMS COMPONENTS. Phase II.

Sept. 1966.

Abstract: This study presents information on the blast vulnerability of community water distribution pipelines, alternate operating techniques for controlling the use of water in early post-attack periods, and on radiological recovery procedures and shelters available to waterworks personnel. The results of the analysis of the vulnerability of pipelines indicate that the primary mode of failure will be crushing of the pipe. The five principal alternate operating techniques considered are: isolation of portions of the distribution system; rationing consumer water use; reducing hydrostatic operating pressures; rerouting water and the utilization of auxiliary sources of water. Planning is stressed for postattack radiological recovery procedures, such as, wet decontamination and the determination of the safe stay times for recovery personnel. It is essential to provide shelter in location as close as possible to the designated tasks that waterworks personnel must perform in early postattack recovery situations.

(NSA:20:45940)

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95) AD-642790 (SWMI-03-1726)

MASS FIRE LIFE HAZARD :Final Report.

Pryor, A.J. and Yuill, C.H.

Sept. 1966.

Abstract: A program was undertaken to define the life hazard in a mass fire environment resulting from nuclear attack. The nature of casualties and hazards in peacetime and wartime fires was reviewed, and experimental efforts to simulate mass fire situations were studied. This state-of-knowledge review revealed a number of areas in need of further definition regarding the true mass fire life hazard. These areas have been specified and limited experimental studies conducted in two of them in order to define their significance with respect to the overall mass fire hazard.

(NSA:21:45272)

96) AD-646627

APPROACH TO DEFINING POST-ATTACK RECOVERY MANAGEMENT CONCEPTS AND TECHNIQUES

Clark, Donald E. et al

Nov. 1966.

Abstract: Potential postattack countermeasures, under the six general categories of protective, radiological, medical, ecological, economic, and social are listed and discussed briefly. A functional approach to the development of postattack recovery management techniques based on current knowledge is suggested, and present developmental limitations are indicated.

97) AD-647006

STUDY OF THE RESPONSE OF BACKPACKING MATERIAL ENCASED A TUNNEL LINER SUBJECTED TO A DYNAMIC DISTURBANCE

Salah, Nosseir, et al.

Dec. 1966.

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Abstract: Deformation behavior is presented for a crushable backpacking material (flat-top stress-strain behavior) encasing a cylindrical tunnel lines, when the surrounding media ~~are~~ subjected to a dynamic disturbance. A mathematical model consisting of a two-degree-of-freedom lumped mass system which approximates the behavior of a tunnel liner backpacking system is used for the analysis. The resistance of the backpacking material is represented by bilinear springs. The differential equations used in representing the motions of the system are presented. An analog computer was used to determine the response of the system. Design-aid curves are presented to help a designer choose the most desirable parameters for the backpacking material for certain design conditions. The main variables in the study were: crushing strength of the backpacking material, mass of the liner, amplitude of disturbing displacement function, and duration of the disturbing displacement function.

(NSA:21:41180)

98) AD-648870

RESEARCH DATA FROM SHELTER OCCUPANCY EXERCISES. :Final Report.

Collins, Robert A. et al.

Dec. 1966.

Abstract: Data from Civil Defense University Extension Program (CDUEP) school exercises were collected and analyzed. As initially defined, the data were to include: information related to experimental manipulations, where introduced into the exercises, background information on participating students, and other data related to the occupancy exercises (supplies and equipment, general feelings about the experience, and management data). Two data collection instruments were developed, both self-administering; one for the students and one for the instructor of the course. Procedures were developed for coding this data and entering codes into punched IBM cards for later transference to magnetic tape for purposes of ultimate storage and analysis. Marginal distributions for student and instructor questionnaire data are exhibited in table form and discussed. Selected cross tabulations are exhibited and discussed. Suggested ideas for future research are listed.

(NSA:21:41181)

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99) ZAD-650323

DEVELOPMENT OF STANDARD FIRE TEST RATING SYSTEMS FOR SHELTER COMPONENTS. :Final Report.

Willis, Labes G. et al.

Dec. 1966.

Abstract: Fire tests for the purpose of rating structural components of blast shelters and fallout shelters are considered. Existing fire test procedures for building construction and materials door assemblies, and window assemblies are analyzed to determine how results from these test may be applied toward the development of a system for rating shelter components. Shelter component performance requirements in regard to heat transmission, smoke and toxic gas build-up in shelter areas, and fire spread and structural collapse are described. Fire exposures for the rating of shelter components are described and classified according to their characteristic modes of heat transfer. The sources of these exposures, described as exposures from fire within the shelter buildings, from fire in individual nearby buildings, from mass fire, and from debris fire, are analyzed and interim data presented on exposure severity. A useful concept for the comparison of fire exposures, based upon their effects on each type of component, is defined.

(NSA:21:39154)

100) AD-650927

EXTENSION OF THE GENERAL SENSITIVITY ANALYSIS. VOLUME 1. METHODOLOGY. :Final Report.

MacMullan, Philip S. & Cruze Alvin M.

March 1967.

Abstract: The final report, Extension of the General Sensitivity Analysis, consists of three volumes. Volume 1, Methodology, discusses the results of demonstration runs employing the methodology on a statewide basis. Volume II, Technical Appendixes, gives details on derivations of the analytical expressions in the model. Volume II also reports: supplementary sensitivity analyses using the model on a limited basis; and sensitivity analysis of population exposure to nuclear weapons effects. Volume III The ANCET

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Computer Program, reports on the details structure of the FORTRAN computer model used to calculate casualties for the sensitivity analyses. The objective of the research reported is to perform Civil Defense System sensitivity analyses which are designed to indicate the relative importance of the parameters used in total civil defense systems evaluation. The following questions must be answered for each parameter: Is the ranking of the effectiveness of civil defense systems altered as the parameter is varied over its range of uncertainty? When the answer to question is affirmative, can further research clarify or narrow the range of uncertainty? Can systems evaluation methodology be altered to reduce the importance of uncertainty? Should systems analyses report effectiveness for several values of the parameter? To assist in these analyses a rapid-running computer model was designed to estimate casualties from a nuclear attack. The model's main features and broad outlines of operation are presented.

(NSA:21:36555)

101) AD-650928 (D-OU-230-2 Vol.2)

EXTENSION OF THE GENERAL SENSITIVITY ANALYSIS VOLUME II. TECHNICAL APPENDIXES. :Final Report.

Cruze Alvin M. & Read, Campbell.

Abstract: Volume I, Methodology, discusses the methodology derived for civil defense activity analyses and the results of demonstration runs employing the methodology on a statewide basis. Volume II, Technical Appendizes, gives details on derivations of the analytical expressions for the prompt effects component model is reported. ANCET, was designed. The model computes both prompt effects and fallout casualties from a thermonuclear attack. The derivation of the analytical expressions for the prompt effects component model is reported in this volume. Analytic procedures for adapting the WSEG-10 fallout model for use as the ANCET fallout component model are also presented. Sensitivity analyses of the effect of choice of parameters of the prompt effects casualty function show that casualty estimates are sensitive both the choice of casualty function and to the assumed yield of the Japanese detonations. A sensitivity analysis of the exposure of population located both in circular urban areas and in circumferential rings to blast overpressure levels from nuclear detonation is also given.

(NSA:21:36556)

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102) AD-650920 (ADU-230-Vol.3)

EXTENSION OF THE GENERAL SENSITIVITY ANALYSIS. VOLUME III
THE ANCENT COMPUTER PROGRAM. :Final Report.

Cruze Alvin et al.

Mar. 1967.

Abstract: Detailed structure is reported of the FOLTRAN computer model utilized to perform the casualty calculations for the sensitivity analyses. The model is designed specifically to assist in performing national sensitivity analyses of total civil defense systems. The model, known by the acronym UNCET, features simplified input data variation and rapid computation of the expected number of casualties from a specified attack. These are accomplished by the use of readily varied analytical expressions throughout the model. These expressions approximate areal population and shelter distributions, prompt effects casualty functions, and various relationships in the fallout model. Included are: instructions for preparation of program input; detailed flow diagrams and verbal descriptions of each of the program subroutines; a description of program output, and a FORTRAN listing of each of the model subroutines.

(NSA:21:36557)

103) AD-651010

TRIAL SURVEY AND ANALYSIS OF SEVERAL BUILDINGS RELATIVE TO THEIR
REUSABILITY AFTER A WAR FIRE. :Final Report.

Adams, Ray et al

May 1966.

Abstract: Computer programs were developed for surveys of buildings relative to external fire exposure, interior fire load, ASTM fire rating of components and of the building's post-warfire reusability. Thirteen Los Angeles area buildings were surveyed and analyzed, and results appear to be reasonable. The accompanying user's manual provides step-by-step instructions for guidance of persons making building surveys to gather input data for the program. Pertinent conditions of, in, and around buildings terminology, and surveying and data recording techniques are given in detail.

(NSA:21:36559)

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104) AD-651167

COST AND FINANCE OF CIVIL DEFENSE: SOME PUBLIC VIEWS.

Coleman, Alan N.

Feb. 1967.

Abstract: An attempt is made to bring together, from a number of national and community studies; the results regarding the American public's views on the cost and financing of civil defense measures and programs. Given the limitations imposed by the number and diversity of the studies used, the following generalizations were obtained; increasing civil defense expenditures in general is believed desirable; many citizens are uncertain about what fallout protection should cost; personal assumption of the total or even partial cost for family shelters is not favored; major objections to family fallout shelters involve cost; favourability of public as well as family fallout shelters is increased when federal or state financial assistance is included; a substantial portion of the citizenry favors a tax reduction or exemption for shelters; indirect inducements for building shelters generally meet the approval of the public; specified alternative methods of financing shelters have been met with disapproval or uncertainty; public shelters are viewed as effective and worth the cost; among alternative programs, education and health rank ahead of civil defense measures, and very few people currently agree that civil defense monies would be better spent on missiles and bombers. The majority of the studies utilized were conducted in the early 1960's, a time when the family shelter controversy reached its apex. General cost and financing issues and alternatives have not been probed extensively in national and community surveys.

(NSA:21:36560)

105) AD-651454.

EFFECTS OF NUCLEAR ATTACK ON FREIGHT TRANSPORTATION SYSTEMS;
INTERACTIONS AND COMPARISONS AMONG MODES. :Final Report.

Dixon, Harvey L.

Mar. 1967.

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Abstract: The operations and equipment used in transferring vehicle loads between two vehicles or between a vehicle and a terminal are examined for seven different classes of cargo. For each of these classes, the usual method of load transfer is discussed, and expedient methods that could be used in a postattack situation are suggested. St. Louis, Missouri, is used to illustrate the problem of moving cargo through a damaged area after a nuclear attack. Several alternative methods of moving cargo via multiple transportation modes are analyzed, and a simple procedure for determining the minimum-time route among the alternatives is proposed. The transportation resources required to deliver the minimum supplies for survivor support in the St. Louis area are analyzed for different mixes of trains and trucks and for movements of the supplies over a range of distances. A general summary of the vulnerability of each transportation mode to nuclear attack is provided, and the remedial actions that might be taken in the preattack period to enhance postattack capability are discussed.

(NSA:21:43077)

106) AD-651805

ON THE DESIGN OF RISK ORIENTED, LOW COST FALLOUT SHELTER SYSTEMS.
:Final Report.

Rockett, Frederick C.

Mar. 1967.

Abstract: Calculations of minimum required fallout protection which would assure high survival probabilities can be made for each U.S. community. Such calculations would provide a basis to fallout. If the CD program combined this balanced fallout protection with emergency evacuation from the more vulnerable areas, then the survival potential could become very great in situations which offered a few days or more of strategic warning. The shelter resources in the U.S. and their potential for such a CD program are analysed.

(NSA:21:43212)

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107) 12-651944

ACCEPTABILITY OF SHELTER RATIONS IN COMBINATIONS WITH ADJUNCTS.
:Interim Report. April-1966-Feb.1967.

Stone, Herbert

March 1967.

Abstract: Improvement in ration acceptability was approached through the use of adjuncts (flavored spreads) in combination with the rations. Of the 14 adjuncts tested, only 8 were found to be preferable to the ration alone when tested in a paired-comparison test. The three adjuncts receiving the highest scores (strawberry jelly) should be considered for storage in civil defense shelters. These results were based on experiments involving 12 subjects for each of the 12 adjunct-ration combination.

(NSA:21:43213)

108) AD-654151

SCATTERED RADIATION (SKYSHINE) CONTRIBUTION TO A CONCRETE-COVERED BASEMENT LOCATED IN A SIMULATED RALLOUT FIELD. :Final Report.

Schumchyk, Michael J. et al.

July 1967.

Abstract: The effect of overhead mass thickness on the shielding characteristics of a concrete-walled basement located in a simulated theoretical calculations set forth in NBS Monograph 42, A uniformly contaminated residual gamma radiation area was simulated to a radius of 600 feet with a cobalt 60 point-source circulation system. Experimental exposure-rate measurement were obtained in the free field and also within a concrete-covered basement as a function of height above the basement floor. Ionization chamber dosimeters were used as radiation detectors. Experimental measurements were extrapolated by analytical procedures to infinite field conditions and divided by the infinite free-field exposure rate measured 3 feet above ground to find the reduction factors. These reduction factors were compared with theoretical results. Experimental results, show that the theoretical formula $T-S$ ($d=0$) $S'(X) S_a$ ($d=0, w$) underestimates the reduction factors. For the concrete cover thickness of 46, 47, and 89 psf used in this experiment reduction factors were underestimated by 13, 16 and 11

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per cent, when calculated by this formula for the 6-foot centre detector locations. This underestimation of the reduction factors increased with depth in the basement to 69, 71, and 73 percent for the three cover thicknesses. The increase in underestimation of the reduction factors was caused by the geometry function $S_a(d=0, w)$. When the theoretical formula was modified to $R=S(d=0) S'(X) I_a(X+34.5, w)$, the formula was applicable to predict the reduction factors to within 28 per cent at all detector locations in a concrete-covered basement with cover thicknesses ranging from 46 to 89 psf. The USANOL experimental skyshine barrier attenuation factor agrees within ± 6 per cent with the theoretical skyshine barrier attenuation factor, $S'(X)$, for overhead mass thickness between 46 and 89 psf.

109) AD-661893 (FTD-HT-66-422)

NUCLEAR WEAPONS AND THEIR DEFENSE.

Chao, Chung-Yao et al.

1965.

Abstract: Explosive nuclear weapons such as atomic bombs, nuclear weapons made in the shape of bombs, shells, and missiles are discussed. The principle involved in their construction is the same throughout. Given in the article are diagrams of the structure of an atomic and hydrogen bomb, an atomic bomb containing atomic explosives in several separate piles, and a thermo-nuclear weapon.

(NSA:22-35961)

110) AD-662749

SHELTER ENTRANCEWAYS AND OPENINGS. :Final Report.

Wiehle, Carl K.

Sept. 1967.

Abstract: The objective of the investigation was to develop, test, and evaluate low cost shelter entranceways and openings for providing protection against the effects of nuclear weapons in the overpressure regions up to 20 psi. The approach adopted was to identify as many factors as possible that influence, limit, or

constrain the entranceway design: to attempt to identify the multitude of inter-acting situations; and to establish the situations most important the design of entranceways for civil defense shelters. From an examination of the numerous influencing factors, parameters were selected as the basis for performing cost analyses for various entranceway configurations. Cost estimates were then prepared for 36 individual entranceways and 2 escape exits. From these data, it was possible to develop the total construction cost of shelter entranceways for loading capacities up to 1,000 persons/min for six general types of entranceways applicable for civil defense fallout and blast shelters. Since the loading capacity required for a specific entranceway system cannot be determined in a general manner beforehand (as explained in the body of the report), the cost data are presented on the basis of the entranceway cost/person for shelter capacities up to 10,000 persons for the six entranceway types and for entranceway loading capacities between 67 and 1,000 persons/min.

(NSA:22:33621)

111) AD-663086 (USNRDL-TR-67)

IGNITION HARDENING OF CELLULOSIC MATERIALS

Norman, J. Alvares & Thomas H. Anderson.

Dec. 1967.

Abstract: The ignition response of blackened alpha-cellulose and cotton cloth, containing fire retardant additives, was compared to the ignition response of these materials without additives. This information was obtained by exposing the samples to various irradiance levels from a calibrated thermal radiation source. Samples treated with retardant compounds which showed the most promise were then isothermally pyrolyzed, in air, so that comparisons between the pyrolysis rates of the samples could be obtained. These comparisons yielded further insight into the mechanism of thermal degradation. Similar ignition response measurements were made with specimens exposed to ionizing radiation. Alpha-cellulose samples containing a mixture of boric acid, borax, and ammonium di-hydrogen phosphate could not be ignited by irradiances up to 4.0 cal/sqcm/sec. Above this value, transient ignition would occur but flaming would last only until the ignitable gases

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were exhausted from the samples. Cotton cloth containing a polymeric retardant with the designation TPC+MM was found to be ignition resistant below an irradiance of 7.0 cal/sq/cm/sec. Comparison of the pyrolysis rates of the retardant treated alpha-cellulose and cotton showed that the retardant mechanism is qualitatively the same. It was also found that gamma radiation results in ignition retardance of cellulose, while irradiation by neutrons, does not.

112) AD-664479 (CONF-56-2)

CIVIL ENGINEERING IN A NUCLEAR ENVIRONMENT.

Office of the Civil Defense, Washington, D.C.

June 1964.

From American Society of Civil Engineers Environmental Engineering Conference, Atlanta.

Abstract: Topics discussed include: design of simple structures for moderate levels of blast resistance; engineering in a thermal environment (warfare resistance and reusability of buildings; thermal radiation from nuclear explosions); and engineering in a fallout environment (fundamental concepts in fallout shelter and fallout problems in civil defense)

(NSA:22:37963)

113) AD-668220

ANALYSIS OF ROOF WASHDOWN VERSUS APPLIED SHIELDING AS A FALLOUT COUNTERMEASURE.

Lee, Hong.

Dec. 1966.

Abstract: Basic applicability and relative worth of roof washdown as a fallout radiation countermeasure are evaluated. The basic purpose of roof washdown is to reduce the radiation dose to occupants of a building by preventing or reducing the accumulation of fallout on the roof. However, the roof washdown system does not effect the penetration of the roof by radiation from other sources.

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It was found that under some circumstances a roof washdown system is a useful means for increasing the protection of building interiors and that, in general, the cost of a washdown system for large roof area structures with smooth sloped roofs will be less than the cost of providing an equivalent amount of shielding. However, applied shielding providing 100 percent reliability whereas roof washdown systems may not be as reliable.

(NSA:22:40344)

114) AEC-tr-5455

DECONTAMINATION TECHNIQUE FOR STRONGLY RADIOACTIVE WATER USED BY ISOLATED CONSUMERS.

Bourrier, Jean et al.

1962.

(c)

Abstract: An emergency decontamination technique is presented for drinking water when families find it necessary to obtain water from sources contaminated by radioactivity. The method consists of passing the water through a mass of earth packed into a simple pail with the bottom lined with cloth and perforated at several points to allow the water to escape. A decontamination factor of an order of magnitude of 100 was obtained in a series of experiments using mixed fission products. Three liters of water per day were passed through each pail containing 12 kg of earth. It is pointed out that the soil type will affect the absorption of fission products and that I^{131} is poorly absorbed by soil. The soil should be taken from below the surface and the radioactive decontamination of the water should be complemented by biological purification. Precautions should also be taken in disposing of the earth to avoid the risk of contamination of other water by the concentrated fission products.

(NSA:17:1659)

115) AEC-tr-6634

RADIOACTIVE FALLOUT. PHYSICS, BIOLOGICAL EFFECTS AND PROTECTIVE MEASURES.

Petrov, R.W. et al

1963

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Translation of Zashchita of Radioaktivnykh Osadkov,
Gosudarstvennoe Izdatel'stvo, Meditsinskoi Literatury, Moscow, 1963.

Abstract: For abstract please see entry No. 332.

116) AIRE-E-6/67

A SURVEY OF REPORTS ON EXPERIMENTAL STUDIES OF THE FORCES EXERTED
ON MODEL STRUCTURES BY THE WIND AND BY BLAST WAVES.

Uppart, J.E.

May 1967.

(R)

Abstract: An extensive bibliography of the work which has been
performed in many countries and over a long period of time, on
the forces exerted by a flow of air, or by blast waves, on model
scale structures is presented. Abstracts are given for reference
to the more important experiments performed under steady flow
conditions in wind tunnels, and blast-wave studies performed in
shock tubes.

(NSA:21:30651)

117) BNL-6080

A COMPARISON OF THE NUCLEAR DEFENSE CAPABILITIES OF NUCLEAR AND
COAL-FIRED POWER PLANTS.

Brookhaven National Lab., Tenn., Sargent and Lundy, Chicago; and Burns
and Roe, Inc., New York.

May 1962.

Abstract: A comparative report is presented in which the economics
and feasibility of plant protection from nuclear attack by plant
hardening, remote siting, and utilization of optional fueling
concepts for the coal-fired plant are evaluated.

(NSA:17:7656)

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118) BNWL-SA-1509 (CONF-680507-2)

POST ATTACK ACTIONS IN A NUCLEAR MASS DISASTER.
Heid, K.R. et al.

Mar. 1968.

(f)

From Conference on Radiological Protection of the Public in
Nuclear Mass Disasters, Interlaken, Switzerland.

Abstract: Post attack actions may be defined as those actions necessary so that individuals, communities, and nations may return to a normal pattern of living following involvement in nuclear warfare. Actions pertaining to an individual who has taken shelter in a home or private shelter that does not have trained radiological leadership are discussed. Several possible sources of radiation resulting from fallout of radioactive debris and the contribution of each source to the total exposure of occupants in typical shelters are described. Suggested reasons for early exits from shelters and recommended activities outside the shelter at various times after the arrival of the fallout are offered. Techniques, methods, and timing of decontamination efforts to minimize the total exposure to occupants of home or private shelters are discussed. The effectiveness of individual efforts to reclaim large open areas such as farms, highways, stores, etc. is compared to the effectiveness of large scale reclamation procedures and techniques. The advantage of participating in planned group efforts for subsequent decontamination are stressed.

(NSA:22:33899)

119) CEX-59.4(Pl.II).

AERIAL RADIOLOGICAL MONITORING SYSTEM. II. PERFORMANCE,
CALIBRATION, AND OPERATIONAL CHECK-OUT OF THE EG & G ARMS-II
REVISED SYSTEM

Hand J.E. et.al.

Oct. 1961.

Abstract: The design, installation, and performance of the Edgerton, Germeshausen & Grier, Inc., Aerial Radiological Monitoring System are described. The system is used to perform aerial surveys of ground radioactivity. It supplies both geographical

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position and radioactivity data in digital form, suitable for use with automatic plotting procedures. Inaccuracies in the geographic positioning data are proportional to the distance flown from a visual ground check point and are, under optimum conditions, a maximum of 750 ft. per 30 miles of flight path. Inaccuracies in the maps on which the data are presented are of about the same order of magnitude. The radioactivity units recorded by the system contain a maximum uncertainty of ± 9.5 per cent. The performance data satisfy the design specifications, and data compatibility is achieved with the existing U.S. Geological Survey-Oak Ridge National Laboratory system (ARMS-I). The ARMS-II equipment is installed in a Beech Model 50 Twin Bonanza airplane. A three-man flight crew operates the aircraft and instrumentation during survey flights. Operational checkout of the system was performed Nov. 13 and 14, 1960, over portions of Frenchman Flat and Yucca Flat, Nevada Test Site. It was concluded that nuclear testing contributed to the surface radioactivity in the northern two-thirds of Yucca Flat and a part of Frenchman Flat but that the natural radioactivity of the surficial materials in the southern third of Yucca Flat and much of the Frenchman Flat area accounts for most of the recorded activity.

(NSA:16:31815)

120) CEX-59.7B (Pt.1)

EXPERIMENTAL RADIATION MEASUREMENTS IN CONVENTIONAL STRUCTURES.
PART I. RADIATION MEASUREMENTS IN TWO TWO-STORY AND THREE
ONE-STORY TYPICAL RESIDENTIAL STRUCTURES BEFORE AND AFTER
MODIFICATION

Burson, Z.G.

June 1963.

Abstract: An experimental study designed to provide a basis for estimating protection against fallout radiation was performed on two-story structures with basements and on three one-story structures without basements. These structures, located at the Nevada Test Site, were studied before and after modifications. An idealized fallout-radiation field was simulated with the use of the Mobile Radiological Measuring Unit. This unit used a sealed radioactive 60Co source that was pumped at a uniform speed through a long length of flexible tubing evenly distri-

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buted over the area of interest. Radiation levels at selected points inside the structures were measured with sensitive ionization-chamber detectors. The experiments were conducted simultaneously with an architectural-engineering study to develop and demonstrate practical means of improving fallout-radiation protection by economical modifications of existing typical houses. Experimental data were gathered at each house before and after shelters were constructed or modified. The effects of various practical modifications of the existent structures, such as adding transite panels to the walls, building planters, or adding baffle walls, were also considered.

(NSA:20:43496)

121) CEX-59.7B (Pt.3)

EXPERIMENTAL RADIATION MEASUREMENTS IN CONVENTIONAL STRUCTURES.
PART III. THE ATTENUATION OF AIR-SCATTERED RADIATION IN A BASEMENT.
Burson, Z.G.

April 1965.

Abstract: An experimental study was conducted to determine the air-scattered radiation contribution to a basement structure from a simulated plane source of ^{60}Co on the ground outside and to determine its attenuation through various structural components. A sealed radioactive source was used to simulate both an area and a ring source. Exposure measurements were made with ionization chamber detectors. A bare, open basement was used as the basic structure. Radiation measurements were made in the open basement; within shelter walls constructed in one end of the basement; within these shelter walls surrounded by sand-bags; in the fully constructed shelter with no sandbags; in both the basement and shelter after a wood roof was constructed over the entire basement; in the basement and shelter after a 4-in. layer of concrete planks was placed over the wood roof; and in the basement and shelter after 8-in. layer of concrete planks was placed over the wood roof. The top of the materials (basement walls, wood roof, or concrete planks) was flush with ground level. This assured that radiation reaching the detectors had been scattered at least once in the air. Comparisons were made with data taken in a similar basement below a two story brick house.

(NSA:20:7298)

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122) CEX-60.1)

EVALUATION OF THE FALLOUT PROTECTION AFFORDED BY BROOKHAVEN
NATIONAL LABORATORY MEDICAL RESEARCH CENTRE.

Borella, H et al.

Feb. 1961.

Abstract: Results of radiation measurements are presented which were made throughout the basement and at first floor sites in the Brookhaven Medical Research Centre. The radiation emanated from a point source and was used to evaluate the protection characteristics for buildings in the Center.

(NSA:16:426)

123) CEX-60.6)

EXPERIMENTAL EVALUATION OF THE RADIATION PROTECTION PROVIDED BY
AN EARTH COVERED SHELTER.

Burson, Z.G. & Borella, H.

April 1961.

Abstract: A study was undertaken to determine the protection against fall-out radiation provided by an earth-covered shelter. The study indicated that the shelter offered excellent protection from fall-out radiation deposited on and around the shelter. This study also added additional data to the research in radiation shielding provided by various structures which is being conducted by the Civil Effects Test Operation, Division of Biology and Medicine, U.S. Atomic Energy Commission. A fall-out radiation field was simulated by pumping, at constant speed, a sealed Co^{60} source through a long length of tubing which was evenly distributed over an area. Radiation measurements were made inside the shelter by dose-integrating ionization chambers. In general, the results indicated that the protection factor (ratio of the open-field exposure dose rate to the exposure dose rate in the structure) was approximately 5000 in the center of the shelter, increasing to 10,000 to 15,000 along the sides, and decreasing to about 3000 near the ends. Directly below vents the protection factor was found to be approximately 2500 at the 3-ft level. The shelter was a half-round corrugated-steel struc-

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ture covered by a minimum of approximately 2 ft of earth on the top and 5 to 7 ft of earth on the sides.

(NSA:16:9730)

124) CEX-61.4

EXPERIMENTAL EVALUATION OF THE FALLOUT RADIATION PROTECTION PROVIDED BY SELECTED STRUCTURES IN THE LOW ANGELES AREA.

Burson, Z.G.

1962.

Abstract: A study designed to provide a basis for estimating protection against fallout radiation was conducted on four diversified structures in the Los Angeles, Calif., area. A fallout radiation field was simulated by a single radioactive Co^{60} source, which was pumped at a uniform speed through a long length of tubing evenly distributed over the area of interest. Measurements of the radiation levels at selected points inside the structures were made with highly sensitive ionization-chamber detectors. Protection factors ranged from 10 to 2000 in a laboratory building, up to 10,000 in a family fallout shelter, from 50 to 150 in a police building, and from less than 10 to approximately 20 in a high school classroom.

(NSA:17:12492)

125) CEX-62.6.2

FORT McCLELLAN RADIO-LOGICAL INSTRUCTION AREA (ARMS-II).

Guillou, R.B.

Mar. 1962.

Abstract: An aerial radiological survey was made to test and evaluate the operation of the ARMS-II system over a high-intensity radiation field of small area. The radiation area was about 1000 yards long and less than 300 yards wide. The sources (Co^{60}) produce a dose rate of about 300 mr/hr along the center line. Data from an areal survey of the range were contoured to show the distribution of the gamma-ray flux at 550 ft above the

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ground. The count rate over the center of the range was greater than 15,000 counts/sec on the low-sensitivity detector. Data on the air attenuation of gamma rays were collected from flights along the center line of the range at altitude ranging from 100 to 3500 ft above the ground. Maximum count rates on high sensitivity ranged from more than 50,000 counts/sec at 1500 ft to about 2000 counts/sec at 3500 ft above the ground.

(NSA:17:26945)

126) CIRA-3

CRITICAL INDUSTRY REPAIR ANALYSIS-FOOD INDUSTRY. :Final Report.

Fernald O.H. and Thomas B.D.

April 1965.

Abstract: The American food industry is analyzed in terms of vulnerability and postattack repair. Processing plants in eight specific segments of the industry are selected on the basis of essentiality and vulnerability: flour, yeast, sugar, citrus fruit, edible oils, fish, meat, and packaging (can and cartons). Vulnerabilities of the plants vary by a whole order of magnitude. The most vulnerable plant faces total destruction at a relatively low 1.2 psi blast overpressure, and the least vulnerable plant is still repairable after a blast of up to 12.0 psi. The older, more massively built plants are generally least vulnerable, hence present the fewest repair problems at any given blast level. There are two general conclusions. First, a severe shortage of both raw and processed food stuffs is improbable, because food manufacturers are both numerous and geographically dispersed. Second, food in one form or another, including ample reserves in the form of stored, surplus commodities, will be available but must be transported. An adequate supply of petroleum is essential to insure the transportation which will provide the food supply.

(NSA:19:36701)

127) CONF-640514

INTERNATIONAL CIVIL DEFENSE SYMPOSIUM ON NUCLEAR RADIATION HAZARDS.

International Civil Defense Organisation, Geneva.

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May 1964.

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Abstract: Defense measures against nuclear radiation hazards are considered. Topics discussed include accidental contamination and **safety** measures in nuclear centers and laboratories, fire preventive measures in enterprisings using radioactive sources, development of legislative problems of nuclear energy and insurance, radiological self protection industry, training of decontamination team and methods of evacuation of radioactive waste, multi-purpose shelter construction, dose-rate measurements using G.M. Counter experience in the measurement of radioactivity in the biosphere and problems arising in case of accidental contamination, fallout contamination of the biosphere, radioactivity monitoring in Finland, Geiger counter vs dosimeter as the ideal civil defense radiation detection instrument, some biological diagnostic tests of the radiation doses following whole-body irradiation, possible hazards to man through the contamination of food with man-made radionuclides, decontamination principles for drinking water and practical application, and a new method for determination of strontium-90 in water using chelating extraction and its technical applicability.

(NSA:21:8838)

128) CONF-650441-2 (Gmelin, ILL-CONF-65-004-2)

PREDICTION OF NEAREST SAFE DISTANCES FOR THERMAL RADIATION OF NUCLEAR WEAPONS.

Kaufman, M.C. and Pitman, James C. Jr.

April 1965.

From Aerospace Medical Association, 36th Annual Scientific Meeting, New York.

Abstract: Data on biological responses of human beings to the thermal radiation produced by the explosions of nuclear weapons are limited to those from World War II experiences with atomic devices. This information is imprecise. Data from animal studies in later nuclear field testing have supplemented earlier information. Field studies are presently prohibited by international agreements but the determination of thermal safe

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distances continues to be of importance for civil defense planning and military operations. If this problem were of academic interest alone, large errors on the conservative side could be readily tolerated. However, the nearest safe thermal distance is of real importance to the military planner. Time-distance-intensity relations for a variety of weapons are provided by the Atomic Energy Commission in their "Nuclear Bomb Effects Computer," a circular slide rule. The information from this device has been plotted showing the intensity-distance relationships for four weapons, starting with the 20 kiloton atomic weapons of World War II. The time required for emission of 80% of the thermal energy for each is also shown, as are the computed points of first and second degree burns. Data are included on the temperature changes of human skin caused by exposure to intense thermal radiation. Techniques were developed to measure subdermal temperature by fine wire thermocouples as well as skin surface temperature by radiometer. These data have been collected during exposure of the unprotected dorsum of the hand to irradiances of the magnitude that occurs in atmospheric explosions of weapons of 0.500 to 15 megaton yields. The maximum temperature at the time of intolerable pain was measured by subdermal thermocouple during exposures to 0.20, 0.23, 0.26, 0.36, 0.48 and 0.70 cal/cm²/sec. The data from 58 experiments on 8 subjects were plotted against time along lines of constant irradiance. Data are also included on the attenuation of thermal radiation by various optical filters. Comparison of the biological data with the computer values indicates that the computer solution for the smaller devices may not be as conservative as it should be, although it compares with actual findings on the atomic explosions in Japan.

(NSA:20:614)

129) CONF-661203

ISOTOPE SYSTEMS DEVELOPMENT PROGRAM: Eighth Annual Contractors Meeting
December 5-6, 1966.

Division of Isotopes Development (AEC) Washington, D.C.

Dec. 1966.

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Abstract: A review of progress in the development of new principles and techniques for using isotopes is presented. Papers presented at the conference are categorized as basic information, analytical aspects, marine device development, environmental applications, industrial applications, aerospace applications, and national security applications.

(NSA/81/32325)

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130) CONF-670208

FRESHWATER FISH IN A NUCLEAR DISASTER.

Shinn, Alvin F.

Feb. 1967.

Abstract: An estimate of the national food supply available in the event of a nuclear attack is presented. It is pointed out that widespread production of freshwater fish in inland water could be an important source of excellent protein. It is estimated that four billion pounds of whole raw fish would supply 30 days of daily 10 g protein supplements for the entire United States population. Levels of radioisotopes from fallout in fish are discussed; it appears that fallout contamination does not severely limit fish production or consumption.

131) UCRL-70894 (CONF-680507-4)

ESTIMATION OF THE INTERNAL DOSE TO MAN FROM THE RADIONUCLIDES PRODUCED IN A SURFACE EXPLOSION OF A NUCLEAR DEVICE.

Ng, Yook C.

May 1968.

From Conference on Radiological Protection of the Public in Nuclear Mass Disasters, Interlaken, Switzerland.

Abstract: A method was developed for estimating the internal dose to man from each radionuclide that is produced and released to the atmosphere following the detonation of a nuclear device. By means of this analysis the nuclides that could contribute most to the internal dose in man can be identified, the internal dose to tissues and organs of man can be estimated, and contributions of individual nuclides to this dose can be determined. Data are tabulated for: meter-rad via milk to the child's whole body and bone from ^{239}Pu fission products; meter-rad via milk to the child's whole body and bone from activation products produced in soil by a surface nuclear explosion; meter-rad via soil to the child's whole body and bone from ^{239}Pu fission products; fractional deposition as a function of post-detonation time; and total estimated dose to the child or infant from a hypothetical 1-Mt surface explosion of a thermonuclear device.

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The figures indicate that under conditions of normal agricultural practice substantial internal dosages could be experienced at very large distances from the site of detonation.

(NSA:22:40669)

132) DASA-1271

BIOLOGICAL EFFECTS OF BLAST. Technical Progress Report.

Clayton, S. B.

Dec. 1961.

Presented at the Armed Forces Medical Symposium, Field Command, DASA, Sandia Base, Albuquerque, N. Mex.,

Abstract: The current state of knowledge relevant to biological blast effects was summarized in a selective manner. Initially, five problems of concern to those who would relate the environmental variations produced by nuclear weapons with biological response and hazard assessment were pointed out. Primary, secondary, tertiary, and miscellaneous blast effects were defined and selected interspecies experimental data of a physical and pathophysiological nature useful in estimating human response were presented. Tentative biological criteria defining safe levels of exposure were set forth as were survival curves for different conditions of exposure in Hiroshima. These were discussed along with the comparative variations in range of the free-field effects as they vary with explosive yield. The fundamental requirement for surviving seconds, minutes, and hours to aet survival for days, weeks, months, and years was emphasized along with the necessity for planning protective measures against all hazardous weapons effects as one attractive alternative for minimizing casualties and maximizing survival in the event of a nuclear war.

(NSA:16:21870)

133) ORCL-364

USE OF MODELS FOR GAMMA SHIELDING STUDIES.

Clifford, C.E.

Feb. 1962.

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Abstract: The use of models for shielding studies of buildings exposed to gamma radiation was evaluated by comparing the dose distributions produced in a blockhouse with movable inside walls exposed to 0.66 Mev gamma radiation with corresponding distributions in an iron 1 to 10 scale model. The effects of air and ground scaling on the readings in the model were also investigated. Iron appeared to be a suitable model material for simple closed buildings but for more complex structures it appeared that the use of iron models would progressively overestimate the gamma shielding protection as the complexity increased.

(NSA:17:7497)

134) EGG-1183-1334 (L-853)

EXPERIMENTAL MEASUREMENT OF FALLOUT PROTECTION PROVIDED BY TRANSPORTATION VEHICLES.

Summers, R.L.

(f)

Abstract: Experimental measurements of fallout protection provided by a school bus and two standard buses were made using the Mobile Radiological Measuring Unit. This unit hydraulically pumps a ^{60}Co source through a length of tubing placed over the ground to simulate a uniform distribution of radioactivity. Two sources were used to simulate the fallout field. Protection factors were determined at different locations in the buses.

135) HI-518-RR (Vol.1)

ENVIRONMENTAL EFFECTS OF NUCLEAR WEAPONS.

Ayres, Robert U.

Dec. 1965.

Abstract: Discussion is presented on: primary radiological effects, including radiation damage mechanisms, fallout, plants, insects, vertebrates; primary thermal effects, including ignition and fire spread and conflagrations and firestorms; atmospheric effects; and secondary damage mechanisms, including epidemics of humans, pest outbreaks, ecosystems, erosion and flooding, and balance of nature.

(NSA:20:20930)

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136) HI-518-ER(Vol.3)

ENVIRONMENTAL EFFECTS OF NUCLEAR WEAPONS. (Summary)

Ayres, Robert U.

Dec. 1965.

Abstract: The four major classes of weapons effects capable of covering large areas are discussed. These include: radiological; thermal; meteorological; and secondary. Environmental-economic factors and countermeasures are also considered.

(NSA:20:20932)

137) HRD-63736

REDUCING THE STRUCTURAL VULNERABILITY OF FOOD-PROCESSING PLANTS TO THE BLAST AND THERMAL EFFECTS OF NUCLEAR WEAPONS.

Randle, H. P. and Robert, I. Y.

April 1964.

Abstract: This report studies the reduction of the structural vulnerability of representative food processing plants in the United States to the blast overpressures and thermal energy released by nuclear weapons. It develops hardening measures for strengthening points or areas of critical weakness. These apply generally to pre-attack protective planning in all industries. Potential damage is analyzed, from field-survey data assembled first-hand at the processing plants, to determine what structural and operational areas are most vulnerable. Beginning with such weak links, practicable hardening measures are then evolved. Consideration of available target-analysis data and the economics of hardening governs implementation of a comprehensive plant protection program. Because of the present general apathy toward civil-defense activity, positive incentives for industry, involving active participation by the federal government, perhaps tax writeoffs, appear in order. Specific plant-study material is included, together with sample calculations for assessing vulnerability at industrial installations. Representative data are included for plants engaged in flour milling, yeast culture, cane sugar refining, edible oil processing, citrus juice processing, sardine packing, and the manufacture of metal or waxed-carton food containers.

(NSA:19:11305)

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138) HSR-RR-67/8-Sd

FEASIBILITY OF DEVELOPING STANDARD DESCRIPTIONS OF POST-ATTACK SITUATIONS.

Nordie, G. Peter.

June 1967.

Abstract: The objective of the study was to evaluate the feasibility of developing a particular methodological tool to aid in conducting research faces the necessity of studying phenomena in hypothetical future situations. To aid in solving the many problems this fact poses, the concept was advanced of a set of standard situational cases reflecting the range of situations nuclear attacks could create. The study was initiated to determine if the concept of the standard situational case offered sufficient promise for development as a practically applicable research tool. It was concluded that development of the original concept of the standard situational case was not feasible primarily for two reasons: the initial inability to provide criteria for distinguishing between relevant and irrelevant information; and the failure to find means for reducing the cases to a manageable number. However, from a number of the insights gained in the course of the study, a new concept was developed different from, but aimed at the same objectives, as the standard situational case concept. This new concept followed from the realization that the definition of recovery would provide criteria for testing the relevance of information about post-attack situations. The remainder of the study was devoted to further development of this new concept of defining critical information categories for post-attack situation. Developing this set of categories involves two basic steps: first, the specification of a set of recovery goals; and second; the delineation of the factors on which the achievement of each goal depends. The concept was partially developed in this report, and the tasks yet required to develop the concept into a fully operational research tool are outlined.

139) IITRI-B6018-1

A PROTOTYPE MANUAL OF METALLURGICAL PRACTICE.

Levinson, D.^{III} et. al.

Mar. 1965.

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Abstract: A manual of metallurgical practice was prepared to serve an educational function for nonprofessionally trained laymen in a post-attack situation. For purposes of this manual it is assumed that normal fabrication facilities and trained metallurgists are unavailable. This document provides information on applications of metals and alloys, identification and recognition, methods of varying the properties, shaping and joining, tool design, and furnace construction.

(NSA:19:46918)

140) IITRI-M-6088

SHELTER EVALUATION PROGRAM. :Final Report.

Heugels W.F. and Feinstein, D.F.

Feb. 1967.

Abstract: A computer model is described which has been developed in order to study the comparison of alternate shelter system in terms of injuries and mortalities sustained by personnel from prompt nuclear weapon effects. These effects include blast, translation, debris, thermal energy and prompt ionizing radiation. Shelter systems include any grouping of above ground structures and their relationship to surrounding contiguous structures. Effects both outside and inside the shelter are evaluated. Hiroshima data compared favourably with model predictions, thus demonstrating a sound basis for studying high yield weapons. High yield weapons effects were studied with respect to their effects on various shelter systems and the results are reported herein.

(NSA:21:39155)

141) IITRI-M-6101

CIVIL DEFENSE SHELTER OPTIONS FOR FALLOUT AND BLAST PROTECTION (DUAL-PURPOSE). :Final Report.

Longinow, A.

May 1967.

Abstract: The economic feasibility of incorporating shelters capable of protection against fallout and blast overpressure of

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20 to 60 psi into public buildings to be constructed in the future and the upgrading of existing structures to meet the specifications for community shelters is discussed. Type of structures considered include: underground parking garages; subway, and basements of large buildings. Data are summarized on existing community shelter in a number of U.S. locations. Physical and environmental data and cost factors are included for these dual-use personnel shelters.

(NSA:21:36574)

142) JPRS-25214

PROTECTING FOOD AND WATER AGAINST CHEMICAL-BIOLOGICAL-RADIOLOGICAL ATTACK.

Kovalenko, V. Ya.

Translated from p.3-64 of Kak Zashchitit-Vodu i Prodoval'stviye of Radioaktivnykh, Otraviyayushchikh Veshchestv i Bakterial'nykh Sredstv. Medgiz, 1963.

Abstract: The properties of radiological, chemical, and bacteriological warfare agents are reviewed from the viewpoint of their contaminating action on food products, forage, water supplies. Methods for the protection and decontamination of food products, forage, and water supplies are discussed for home conditions and conditions where technological equipment is used for large-scale operations. Various types of packaging material are evaluated for their protective effects against the three types of noxious agents. Monitoring methods and protective clothing are discussed, and methods are outlined for decontamination, degassing, and disinfection of various food-stuffs, raw materials, forage, and water supplies. The effectiveness of various decontaminating agents and methods are evaluated. Methods for the destruction of provisions and forage that do not yield to decontamination are also described.

143) JPRS-30979

PATHOLOGY, CLINICAL PICTURE AND THERAPY IN AFFECTIONS WITH TOXIC AND RADIOLOGICAL AGENTS.

Bogdanov, N.A.

Translated from pp.1-192 of Patologiya, Kinika i Terapiya Pri Porazheniyakh OV i RV, Leningrad, 1964.

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Abstract: The characteristics and pathological effects of radiological and chemical warfare agents are reviewed. First aid treatment methods are outlined for persons exposed to these agents. Topics discussed include acute and chronic radiation sickness; radioinduced skin lesions; internal irradiation; the toxic effects of phosphororganic agents; the toxic effects of hydrocyanic acid; the toxic effects of carbon monoxide; skin irritants, such as Lewisite and Yperite; the asphyxiating effects of phosgene, diphosgene, and nitrous oxides; toxic smokes; lacrimators or tear gases; incendiary agents and flame-thrower mixtures; intoxication by smoke-forming agents; poisoning by industrial liquids such as tetraethyl lead, ethylene glycol (antifreeze), methyl alcohol, and dichlorethane; methods for detecting war gases; radiation dosimetry; methods for radiological and gas decontamination; individual and group protective equipment, including gas masks and anti-chemical protection of the skin; and group protective equipment such as shelters for the protection of groups against the effects of nuclear, chemical, and bacteriological warfare agents.

(NSA:19:46651)

144) JPRS-31914 (TT-65-31512)

ENGINEERING AND RESCUE OPERATIONS AT THE SITE OF AN ATOMIC STRIKE.

Volkov, I.D. et al.

1965.

Abstract: Information is included on: characteristics of the site of an atomic strike and the kinds of operations which are performed, the composition of the forces; principles of their organization and training; means of mechanization and methods of conducting and organizing engineer-rescue operations; and fundamentals of the utilization of civil defense units and of control and material-technical support when performing rescue operations at the site of a nuclear strike.

(NSA:20:4191)

145) JPRS-34578 (TT-66-31018)

HOW TO PURIFY AND TO DISINFECT WATER WITH THE SIMPLEST MEANS.

Vekhov, S.P. and Sokolova, N.F.

1965

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Abstract: The contamination, protection, and purification of water supplies in the event of mass-attack, which includes nuclear, chemical, and bacteriological forms of weapons, are discussed. Reagents, sorbents, and other materials used for the purification of water are listed.

(NSA-20:23382)

146) LAMDA-3(Vol.1)

AN OPTIMIZATION STUDY OF BLAST SHELTER DEPLOYMENT. VOLUME 1. SUMMARY REPORT.

Mitchell, David L.

Sept. 1966.

Abstract: Methods of determining blast shelter deployments and of assessing their performance for a variety of nuclear attacks were examined. Stabilized deployments, which protect the population almost as well as optimal deployment, even though it is not truly optimal for any specified attack are preferred. The study examines the attacker's freedom to vary force level, time to attack, attack objective, height of burst and targeting. A computer model, BLAST, is described which generates shelter deployments for the U.S. and computes their effectiveness against attacks in which these factors are varied. The methodology, results, and conclusions are summarized.

(NSA-21:41183)

147) LAMDA-3(Vol.2)

AN OPTIMIZATION STUDY OF BLAST SHELTER DEPLOYMENT. VOLUME II. APPENDICES A-G.

Mitchell, David L.

Sept. 1966.

Abstract: Methods of determining blast shelter deployments and of assessing their performance for a variety of nuclear attacks

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were examined. Stabilized deployments which protect the population almost as well as an optimal deployment, even though it is not truly optimal for any specified attack are preferred. The study examines the attacker's freedom to vary force level, time of attack, attack objective, height of burst, and targeting. A computer model BLAST generates shelter deployments for the U.S. and computes their effectiveness against attacks in which these factors are varied. Seven technical appendixes, including the data employed, are presented.

(NSA:21:41183)

148) LAMBDA-3(Vol.3)

AN OPTIMIZATION STUDY OF BLAST SHELTER DEPLOYMENT. VOLUME III.
APPENDIX A. BLAST: THE COMPUTER PROGRAM.

Mitchell, David L.

Sept. 1966.

Abstract: Methods of determining blast shelter deployments and of assessing their performance for a variety of nuclear attacks were examined. Stabilized deployments which protect the population almost as well as an optimal deployment, even though it is not truly optimal for any specified attack is preferred. The study examines the attacker's freedom to vary force level, time of attack, attack objective, height of burst, and targeting. A computer model BLAST generates shelter deployments for the U.S. and computes their effectiveness against attack in which these factors are varied. BLAST is described in detail for the analyst and programmer.

(NSA:21:41184)

149) MMPP-S-1

DESIGN FOR A BLAST, FIRE, AND FALL-OUT SHELTER.

Hammit, Frederick G.

Sept. 1962.

Abstract: A shelter built in Ann Arbor, Mich., is described. This shelter is thought to be the result of a reasonable design

compromise of protection factors for an area of type in which it was built. It is noted that protection from blast, fire, and fallout are of primary importance, and the optimum protection sought in a shelter depends on many factors the most important of which is the proximity of the shelter to possible targets and direction of the prevailing winds.

(NSA:17:12494)

149A) NBS-MON-76

AN ENGINEERING METHOD FOR CALCULATING PROTECTION AFFORDED BY STRUCTURES AGAINST FALLOUT RADIATION.

Eisenhauer, Charles

July 1964.

Abstract: Technical assumptions underlying the methods currently recommended by the Office of Civil Defense (OCD) for calculating protection afforded by structures against fallout radiation are discussed. Included are methods for calculating the contributions from radioactive sources on the roof and on the ground surrounding a simple one-story building. It is shown in detail how each technical chart in the OCD Professional Manual is derived from basic data on radiation penetration. Charts are included in order to make the report self-contained.

(NSA:20:11030)

150) NDL-TR-33

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SIMPLE/CONTAMINATION OF RESIDENTIAL AREAS - McCoy-III.

Maloney, J.C. and Meredith, J.L.

Sept. 1962.

Abstract: The effectiveness achieved, the effort required, and the dose received by personnel in the use of simple decontamination procedures for the radiological recovery of residential areas was investigated. Fall-out simulant was prepared by tagging 15 μ to 300 μ sand with lanthanum-140. The simulant was dispersed onto lawns, paved areas, and roofs. Decontamination techniques using household and garden tools were evaluated. In addition, the radiological recovery of a small residence and surrounding lawn was effected.

(NSA:17:1658)

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151) NP-11653

HARDENING-OPTIMUM BLAST PROTECTION FOR MINIMUM COST.

Christensen W.J.

May 1962.

Abstract: A method is presented of assisting in the choice of a design for overpressure which gives maximum survival probability. The method is applicable to various types of relatively shallow buried cut-and-cover structures subjected to potential air blast damage by direct attack with nuclear weapons. It is noted that the method should not be used as a rigid criteria.

(NSA:16:20869)

152) NP-12016 (TO-B-61-35)

MODELING TECHNIQUES AS APPLIED TO FALLOUT SIMULATION ON RESIDENTIAL-TYPE STRUCTURES AND SOME PRELIMINARY RESULTS.

Starbird, Albert W. et al.

July 1961.

Abstract: An experimental study was made of the radiation attenuation of two residential-type structures. The two model structures investigated were surrounded with rings and annular areas of simulated fall-out by pumping a 10-curie, cobalt-60 source through plastic tubing at a constant velocity. Radiation measurements were taken with time-integrating detectors. The theory of measuring radiation effects with models is discussed and the facility developed for OCEM at Technical Operations, Incorporated, Burlington, Massachusetts, to conduct these experiments is described. A comparison is made of experimental data obtained in these tests with data obtained in previous full-scale tests made on identical structures at the Nevada Test Site.

(NSA:16:30676)

153) NP-12902

THE RECOVERY AND RESTORATION OF METROPOLITAN WATER WORKS FOLLOWING NUCLEAR WAR ATTACK.

Engineering-Science, Inc., Arcadia, Calif.

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May 1963

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Abstract: A detailed review was made of existing waterworks preparedness with respect to civil defense in 9 large metropolitan areas. Results indicate that the preparedness of metropolitan water supply systems to recover from the effects of a disaster due to nuclear war is only 50%. Suggestions are presented for improving the preparedness and enhancing the capability for early recovery of water supply utilities in the event of nuclear attack.

(NSA:17:27595)

154) NP-13126

CIVIL DEFENSE MANUAL FOR RADIOLOGICAL DECONTAMINATION ON OF
MUNICIPALITIES.

Wheeler, C.H. (Jr.) & Cammarano, M.V.

Aug. 1963.

Abstract: Radiological defense consists primarily of protection from fallout. This manual covers the operational recovery phase of radiological defense, which is concerned with decontamination of structures and areas made dangerous or lethal by fallout. It assumes that no significant damage has been sustained in the area due to blast or fire. The physical phenomena associated with nuclear detonations and the biological effects of the associated radioactive fallout are described. The problems of municipal planning for radiological defense are discussed, and a plan for an actual American city is included as an example. Detailed technical information on methods of decontamination is presented. The instructions cover the cleaning of building structures, pavement and natural areas. One chapter deals with cold weather decontamination problems. The efficiencies of decontamination methods and equipment are evaluated in terms of human effort. Analytical procedures are developed, including estimating and worksheet forms, for municipal radiological defense planning. These procedures are applied in a hypothetical case history of a municipal defense zone.

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155) NP-13147

PREDICTION OF FIRE SPREAD FOLLOWING NUCLEAR EXPLOSIONS.

Chandler, Craig C. et al.

1963.

Abstract: An exhaustive study was made to identify the parameters significant to the spread and intensity of mass fires, suggest methods of measuring and codifying these parameters, and collect specific input data to be used in testing a predictive model of fire spread. The study was confined to mass fires spreading from the area of initial ignitions following nuclear attack, and the behavior of these fires was assumed to be similar to that of "normal" large-area fires which occurred in the past. Nearly 2,000 fires were studied, 1,687 rates of spread were collected, and conditions were determined under which fires would not spread significantly and/or would be self-extinguished.

(NSA:17:41025)

156) NP-13568

CASUALTIES FROM NUCLEAR WEAPONS. A MANUAL FOR EMERGENCY HEALTH SERVICES.

Department of National Health and Welfare, Ottawa, Canada

1963.

Abstract: Information is summarized for the use of members of health professions on the prevention and management of casualties resulting from the explosion of a multi-megaton nuclear weapon. The effects of blast, shock waves, thermal radiation from the explosion, fires, trauma caused by missiles, ionizing radiations, early and late fallout, and communicable disease on populations are considered. It is postulated that during the first post-attack week traumatic and thermal casualties will present the major problems; from the second through the fourth weeks acute radiation syndrome will develop in unshielded populations; and after the fourth week communicable disease will become a serious threat to the disorganized community. The protection afforded by various types of shelters, monitoring methods, methods for the decontamination of personnel and equipment, methods for the survey of food and water supplies, and hospital facilities and medical services likely to be available in Canada are discussed.

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157) NP-13604

USDA RADIOLOGICAL MONITORING HANDBOOK.

Department of Agriculture, Agriculture Research Service, Beltsville.

July 1963.

Abstract: Procedures are described for the monitoring of radiological fallout on agricultural and forest lands; in water used for agricultural purposes, live-stock, meat and poultry; and commodities stored or harvestable on farms and ranches. Radiological monitoring includes identifying radiation, measuring its intensity, interpreting radiological data, and helping to develop defense plans that will prevent or alleviate damage and injury from excessive radiation. It is pointed out that the levels of radiation associated with fallout from nuclear weapons testing are so low that civil defense instruments now available are unable to measure accurately the resulting degree of contamination.

158) NP-13740

STUDY OF PROCESSES FOR THE PRODUCTION OF POTABLE WATER FROM AQUEOUS WASTES DEVELOPED IN A SHELTER.

Badger, W.L.

Oct. 1962.

Abstract: As adequate supply of potable water is an essential requirement in a fallout shelter. This study has evaluated many known means of converting aqueous shelter wastes into potable water. A comparison of various processes led to the selection of the three most feasible systems with a system of pre-and post-treatment and testing common to all. The processes selected as most likely to produce acceptable potable water are: (1) vapor compression distillation, (2) ion exchange and charcoal adsorption, and (3) electrodialysis. Preliminary specifications of equipment, utilities consumed, and estimated costs are given for each process. Water from the air, extracted by an air conditioning system, is discussed and recommendations made. Recovery systems are ~~contrasted to the normal~~ means of water supply and it is recommended that the conventional means of supply should ordinarily be used. Recommendations are made for future research and development work. A bibliography covering the literature studied, charts, and process flow diagrams are included.

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159) NP-13885 (S-235-R)

RADIOLOGICAL MONITORING FOR CIVIL DEFENSE.

Edgerton, Germeshausen and Grier, Inc., Santa Barbara Calif.

Aug. 1963.

Abstract: Radiological monitoring and fallout prediction concepts of the present civil defense program are presented; and recommendations result from a detailed study of the radiological information needs and various radiological monitoring methods. This study included instrumentation and equipment, small scale perturbations of the radiation field by various factors, and fallout prediction methods. The recommendations made include using aerial monitoring techniques as the primary radiological monitoring method and considering the use of a fixed automatic system at the national level only. Other specific recommendations involve instrumentation, training and organization.

160) NP-13942

IMPROVEMENT OF PROTECTION DATA BASE FOR DAMAGE ASSESSMENT AND DATA BASE ON SHELTER NEEDS: AN EXAMINATION OF THE "PV" DATA FROM THE NFSS. Final Report. Vol. III.

McMullan, Philip et al.

1964.

Abstract: The sensitivity of direct weapons effects fatality computations to the change in structural protection indicated by the Physical Vulnerability (PV) data from the National Fallout Shelter Survey (NFSS) was examined. This examination was made as a preliminary to utilizing the PV data for existing damage assessment and vulnerability analysis routines such as those in the National Resource Evaluation Center's (NREC) Jumbo III system. An analysis of Columbus, Ohio, Sacramento, Calif., and Scranton, Penn., selected as three typical cities, subjected to direct weapons effects shows that when available NFSS shelters are utilized rather than residential dwellings alone, predicted fatalities based on Dikewood Corporation fatality curves decrease by at most 10% of the city's population. This analysis holds the population distribution and weapon characteristics

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invariant while changing only the structural protection afforded shelterees. It is unlikely that the reduction would approach this percentage except for a few selected city-attack combinations. It is recommended that no PV modifications be made in existing damage assessment routines for national assessments; even though only residential dwelling protection is assumed, until a further study of direct effects casualties in basements and core areas of NFSS structures is completed by the Dikewood Corporation. An analytical fatality computation procedure using the Weiss population distribution model and an analytic fatality-distance curve is also derived and its application to one city is illustrated.

161) NP-14108 (PG-80-7)

EMERGENCY OPERATING CENTERS.

Jan. 1964.

Abstract: Emergency operating centers are intended to serve as protected facilities to provide for the command and control function of political jurisdictions from which responsible officials can command and control emergency operations during and after a nuclear attack. Data are presented for the guidance of architects engaged in the design of protective structures either as separate underground structures or incorporated into the basement of public or office buildings. Topics discussed include site selection; structural factors; blast closures and protective systems; heating, ventilation, and air conditioning; plumbing; emergency power sources; communications centers; and methods used for ground shock testing.

162) NP-14207

A PROTOTYPE MANUAL FOR PLANNING, ANALYZING AND SCHEDULING FOR RADIOLOGICAL EXPOSURE.

Cammarano, Mario V.

May 1964.

Abstract: A planning strategy designed for use during the post-attack phase of a nuclear attack is presented. The report also presents the planning assumptions and techniques specifically expressed in the Second Edition of A Prototype Civil Defense Manual for Radiological Decontamination of Municipalities pre-

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pared for the Office of Civil Defense. Included is a description of the post-attack picture and a discussion of the characteristics of the radiation field with respect to time after detonation and distance from ground zero. The mathematical basis for, and operation of a dose accumulation analyzer are presented. The analyzer is designed to yield fast, accurate information on the probable dose accumulation in personnel resulting from any desired exposure schedule. Data concerning area entry time, minimum shelter stay time, optimum starting times for work crews, optimum evacuation time, and decontamination feasibility, for any combination of standard dose rate and residual number, effective fallout arrival time, and any allowed dose criterion can easily be obtained from the analyzer.

163) NP-14208 (Vol.I)

A PROTOTYPE CIVIL DEFENSE MANUAL FOR RADIOLOGICAL DECONTAMINATION OF MUNICIPALITIES. SECOND EDITION. VOLUME I. DECONTAMINATION PLANNING.

Cammarano, Mario V. et.al.

May 1964.

Abstract: The physical phenomena associated with nuclear detonations and the biological effects of the associated radioactive fallout are reviewed. Both pre-attack and post-attack analytical planning procedures are discussed for the radiological decontamination of municipalities. The efficiencies of decontamination methods and equipment are evaluated in terms of effectiveness and human effort, fuel and water requirements. A concept is developed for the sub-division of large municipalities into smaller, operational zones for decontamination operations. A zone may consist of an existing school district, precinct, or ward, depending upon local conditions. A post-attack scenario is presented to describe conditions that may be encountered in various areas surrounding and downwind from a nuclear detonation. Procedures are described for the decontamination of structures and areas that have been made dangerous by fallout.

164) NP-14208-(Vol.II)

A PROTOTYPE CIVIL DEFENSE MANUAL FOR RADIOLOGICAL DECONTAMINATION OF MUNICIPALITIES. SECOND EDITION. VOLUME II. DECONTAMINATION OPERATIONS.

Cammarano, Mario V. et al.

May 1964.

Abstract: Practical, operational information is presented on the decontamination of radioactive fallout. The types of surfaces which will be encountered, the methods best suited to their decontamination, and the special considerations required by cold weather are discussed. Three basic principles of fallout decontamination are reviewed including cleaning the surface, removing the surface, and covering the surface. The various methods for achieving decontamination are categorized as wet or dry methods for achieving decontamination are categorized as wet or dry methods, and are discussed individually in detail. Team make-ups, equipment requirements, and operational procedures for the decontamination of municipalities from fallout from nuclear detonations are included.

165) NP-14773

THE EFFECTIVENESS OF RADIOLOGICAL COUNTERMEASURES IN ACCELERATING POSTATTACK RECOVERY.

Douglas, Joseph D.

May 1964.

Abstract: The extent to which radiological countermeasures could accelerate the postattack recovery process was evaluated. The recovery of a facility is specified in terms of the duration of the activity, the time when the activity is to commence, the allowable dose received by the activity personnel, the fallout field characteristics, and the effect of the countermeasure on these field characteristics. The acceleration of the recovery is specified by the difference between the time when the activity may commence if the countermeasure is not employed and the time when the activity may commence if the countermeasure is employed. This difference, the time saved, is analyzed as a function of the other parameters. The analysis is examined in a general manner to determine the range of situations where countermeasures appear to be potentially most valuable.

(NSA:19:15/87)

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- 166) NP-14780
CASUALTIES FROM NUCLEAR WEAPONS. A MANUAL FOR EMERGENCY HEALTH SERVICES.

Department of National Health and Welfare, Ottawa.

1964.

Abstract: Information is presented for the use of the several health professions engaged in the prevention and management of casualties produced by multi-megaton nuclear weapons. The physical principles of nuclear weapons are reviewed. Casualties are considered from the standpoint of those caused by blast, thermal radiation, initial ionizing radiations, and fallout. Available data are reviewed and estimates are presented of the various types of casualties expected under various conditions and at various post-attack times. During the first week it is expected that the patient workload will consist of traumatic and thermal injuries, during the second, third, and fourth weeks the acute radiation syndrome will develop, and after the fourth week communicable diseases are expected to present the major problem. The characteristics of fallout and radiation hazards from the internal and external deposition of fallout fission products are discussed. The problems presented by the contamination of food, milk, water supplies, drugs, and x-ray films by fallout are considered and decontamination procedures are outlined for food, milk, and drinking water. The importance of shelters and the protection provided by various types of structures are discussed. Results are included from a survey of Canadian hospitals in non-target areas.

(NSA:19:13668)

- 167) NP-14835

POSTATTACK SANITATION WASTE DISPOSAL, PEST AND VECTOR CONTROL REQUIREMENTS AND PROCEDURES.

Engineering-Science, Inc., Arroyo, Calif.

Feb. 1965.

Abstract: In the event of a nuclear attack on the United States, environmental disease control measures will be interrupted with the surviving population exposed to the ensuing disease hazards. The probability of the occurrence of some 14 diseases that might develop is considered and the effectiveness of available control

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measures and the total operational requirement for recovery of environmental sanitation in terms of manpower, equipment, and material are evaluated. The enteric infections (Shigellosis, Infectious Hepatitis, Salmonellosis, Typhoid, and Amoebiasis), especially Shigellosis (bacillary dysentery), are assigned a leading role among the diseases to be controlled, thus indicating a compelling need for the prompt removal and sanitary disposal of human feces and of spoiled food and other decomposable fly breeding potential organic material. Pending the establishment of sanitary disposal of organic wastes, the control of houseflies by adulticiding is indicated when climatic conditions favor fly production. The hazard of mosquito-borne encephalities in those parts of the United States where encephalitis is endemic necessitates early postattack operations, as climatic conditions dictate, to rid the areas of adult mosquitoes by adulticiding with larvicidal treatment to follow. Diseases of secondary concern are Rabies, Murine Typhus, Plague, Leptospirosis, Rocky Mountain Spotted Fever, Dengue, Malaria and Yellow Fever. The endemicity of these diseases is related to the geodition with timing and extent of control related to these factors. The control of domestic rodents in the United States west of the 100° Meridian to reduce the hazard of Plague and control in the Southeastern United States and Southern California to reduce the hazard of Murine Typhus is indicated where a condition of structural damage and fallout results in sheltering for an appreciable period of time. Significantly effective control of these disease hazards in the postattack environment is possible through the utilization of material and equipment properly positioned for prompt postattack operations. The magnitude of these needs (material, equipment, and manpower) is developed for an estimated metropolitan population of 88 million.

(NSA:19:15788)

168) NP-15092

CENIZA-ARENA CLEANUP IN SAN JOSE, COSTA RICA: OPERATIONAL ASPECTS
AS RELATED TO NUCLEAR WEAPON FALLOUT DECONTAMINATION.

Donald, C.E. and Lee H.

May 1965.

Abstract: The continuing eruptions of Volcán Irazú and the consequent deposition of volcanic debris on the city of San José, Costa Rica, offered a unique opportunity to study the physical effects of fallout-like particles deposited in urban areas. Detailed records of the particles deposition and removal from San José were tabulated and analyzed. The magnitude and problems of decontaminating a fallout contaminated city were illustrated (except for the complicity of radiation) in the San José cleanup operations.

(NSA:19:32468)

169) NP-15096

INTRODUCTION TO RADIOLOGICAL DEFENSE PLANNING.

Miller C.F. et.al.

May 1965.

Abstract: Basic radiological data, major parameters, and equations are presented for use in the calculation of the radiation dose from fallout for populations exposed during nuclear warfare. Sample calculations are included for three operational routines. The influence of shelter availability, shelter efficiency, length of shelter occupancy, and time after detonation on radiation dose are considered. Correction factors are included for use in the basic exposure dose equations when fallout arrival time is longer than one hour after detonation. Applications in planning radiological defense and countermeasures are discussed.

(NSA:19:34405)

170) NP-15181

FIRE BEHAVIOR, IGNITION TO FLASHOVER.

:Summary of Research Report.

Vodvarka, F.J., and Waterman, T.E.

contd.....

June 1965.

NMM/mau

Abstract: An experimental program was conducted on the fire build-up resulting from flaming ignitions of major furniture items in simulated residential rooms. Times were determined for the fires to develop beyond elementary extinguishment techniques, and for flashover to occur. The data provide information for determining personnel requirements for civil defense firefighting teams and brigades. In rooms with conventional upholstery, in rooms with foam rubber upholstery, and in bedrooms with box springs, 90% of the fires developed beyond self-help extinguishment capabilities in 26, 8, and 12 minutes, respectively. Bedrooms with open-spring beds did not flash over.

(NSA:19:36706)

171) NP-15328

EVALUATION OF FALLOUT CONTAMINATION OF WATER SUPPLIES. :Final Technical Report. Oct. 1, 1963 - May 15, 1965.

Gurne, W.N. et.al.

1965.

Abstract: A theoretical evaluation was conducted to determine the potential degree of water contamination from fallout and to assess the biological hazards associated with the ingestion of water following hypothetical nuclear attack. The appraisal was carried out by applying the assigned fallout model to various levels of nuclear war and by quantitative correlation of all phases of the flow of radioactive fallout in public water supplies. The water supply systems of three cities were selected for the evaluation of contamination to study the potential hazards and radiobiological effects. Maximum levels of ^{89}Sr , ^{90}Sr , ^{106}Ru , ^{131}I , ^{137}Cs , and ^{140}Ba were calculated and reported in $\mu\text{C/ml}$. Results indicate that water contamination for some cities may be at a substantial level of activity, especially when watershed runoff is included. Direct surface contamination of these reservoirs, excluding any contribution from watershed runoff, resulted in activity concentrations which were lower by a factor from 10 to 100. A detailed analysis of various criteria for biological uptake was completed.

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Ten computer programs were established to assist the ~~computations~~ in various phases of the study. A study was also made to obtain a first approximation of the relationship between activity distribution and fallout particle size. The relationship is observed to be in close conformance to a log-normal distribution.

(NSA:1942658)

172) NP-15708

SECONDARY IGNITIONS IN NUCLEAR ATTACK. :Final Report.

McAuliffe, John; Moll, Kendall.

July 1965.

Abstract: Secondary fires (i.e. fires caused by blast and other nonthermal effects) and other fires caused by disruptions to normal activities because of attack were analyzed. Secondary ignition frequencies were estimated at 0.006 per 1,000 sq.ft of total floor area damaged by at least 2 psi blast pressure. This estimate is consistent with available data from atomic and conventional bombings, explosive disasters, and earthquake and tornado experiences. The estimate implies that secondary ignitions can be the major cause of nuclear fires. Existing contradictory conclusions from Hiroshima and Nagasaki were resolved on the basis of known physical effects. It was found from statistical analyses that the most hazardous structures are wooden ones; the most hazardous fire sources are electrical and heating equipment; and the most hazardous occupancies are storage of high-energy materials such as oil and chemicals. It attributes secondary ignitions mainly to the rupture of fuel lines and containers by flying debris and collapsing structures. It was concluded that fires during warning and postattack recovery periods are not potentially critical civil defense problems. However, hazards from such fires, as well as from nuclear-and disaster-caused other energy supplies.

(NSA:20:11031)

173) NP-15770

SUPPLEMENTAL ANALYSIS CIVIL DEFENSE RESCUE.
Phase 1b Analytical Report.

Crain, John L. et al.

Aug. 1965.

cont d.....

NMM/mau

Abstract: The results of extended studies on the trapping function, the probable number of persons to be trapped in debris; the relationship between thermal effects and rescue feasibility; the organizational requirements and other criteria on which a rescue system must be based; and techniques for detection of existence of life within debris are reported. The four research areas are treated separately, but integrated within a common introduction and summary.

(NSA:20:9178)

174) NP-16585

OPERATION CENIZA-ARENA: TECHNIQUES FOR THE MEASUREMENT OF DEPOSITION AND REDISTRIBUTION OF FALLOUT AROUND STRUCTURES.

Clark, Donald E. et.al.

Stanford Research Inst., Menlo Park, Calif.

Dec. 1966.

Abstract: The continuing eruptions of Volcan Irazu and the consequent deposition of Volcanic debris on the city of San José, Costa Rica, were used to study the deposition and redistribution of fallout like particles (ceniza-arena) around structures. The techniques for the measurement of the deposition and redistribution of fallout were proof-tested and evaluated during the series of field measurements. The results were limited by the lack of volcanic activity during the measurement periods; however, the measurements showed a possible relationship between wind speed and the mass of fallout deposited.

(NSA:21:16013)

175) NP-16776

THE PREPARATION OF SIMPLIFIED MANUALS FOR SHIELDING ANALYSIS.

Batter, John F. et.al.

March 1967.

Abstract: The technology of shelter prediction from fallout radiation has advanced sufficiently to justify confidence in shelter factors computed for above-ground locations without

interior partitions, when the sheltering structure is exposed to an infinite field of contamination. For other situations, such as the basement of a structure or a field of contamination that is not infinite, either existing experimental data do not agree well with computed values or the two techniques of calculation produce conflicting results. Simplified methods of calculation are presented to accurately predict the contribution of 'in and down' scattering from both interior and exterior walls to the dose rate in a below-ground area, to show the effects of limited strips of contamination on the dose rate in both above-and below-ground locations, and to predict the effects of interior walls on the dose rate in above-and below-ground areas.

176) NP-16776 (suppl.1)

THE PREPARATION OF SIMPLIFIED MANUALS FOR SHIELDING ANALYSIS.
SUPPLEMENT ONE: IN AND DOWN SCATTERING AND FINITE FIELDS OF
CONTAMINATION. :Final Report.

Starbird, Albert W., et.al.

March 1967.

Abstract: A study is described in which present and proposed methods of calculating the attenuation afforded 'in and down' scattered radiation by a horizontal slab, and the effects of finite fields of contamination are discussed. The assumption used in computing the 'in and down' attenuation factor, assessment on the resulting attenuation factors, and comparisons with the latest available experimental data are presented. Recommendations are provided as to 'best value' factors and how they might be included in existing publications. The effects of finite fields of contamination were subjected to further analysis by directly comparing the existing method of calculation with results obtained using transmission coefficients calculated by the Monte Carlo method. This comparison, though complete only for above-ground locations, indicates that further study is required before the existing method of calculation can be relied upon.

(NSA:21:30653)

177) NP-16804

SUMMARY OF COST TRENDS OF MASS PRODUCTION AS APPLIED TO 5 TO 10
P&I SHELTERS: Final Report.

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Curione, Charles

February, 1967.

Abstract: The cost reduction potential of mass production techniques applied to 5 to 10 psi shelter construction programs is determined. Various industries employing mass production methods in the manufacture of structures or structural components were invited to provide comments pertinent to this research. Reports and studies covering shelter costs were reviewed, and applicable cost data were integrated into this report. The findings of this research indicate that some cost reduction can be achieved by use of mass production techniques where such techniques are applied to shelter construction. However, mass production does not always achieve the magnitude of cost reduction expected.

(NSA:21:30654)

178) NP-16806

AN EXPERIMENTAL INVESTIGATION OF FRANGIBLE PLATE FRAGMENTATION.
:Final Report, Summary.

Liber, Theodore et.al.

October 1966.

Abstract: The fragmentation of dynamically loaded homogeneous brittle plates was studied by means of a rop test facility. Multiple tests were conducted on five different size model plaster plates under two loading conditions. The results indicated that the plate response is statistical in nature and that a definite fracture pattern emerges. Furthermore, they give rise to the working hypothesis that the cracks propagate along the maximum stress trajectories associated with the forced vibration mode.

(NSA:21:30646)

179) NP-16861

PRELIMINARY AERIAL INFRARED FIRE MAPPING SYSTEMS ANALYSIS.
:Final Report.

Richard, Sheeder D.

April 1967.

NMM/man

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Abstract: A detailed analysis of factors relevant to the infrared thermal mapping of hypothetical nuclear bursts in the State of Michigan was performed. Areas deemed critical to the recovery of the state were determined and designated to be the areas mapped in the event they were struck by a nuclear burst. A survey of civilian aircraft was performed to determine the number and distribution of those possibly available to perform the mapping flight. The total time for the mapping missions was computed for four different thermal mapping system options and for three different levels of mapping resources. An analysis of the numerical data was performed.

(NSA:21:365777)

180) NP-16877

TEST AND EVALUATION OF COMPUTER ANALYSIS PROGRAMS FOR SHELTERS IN BUILDINGS. :Final Report.

Weissman, Samuel, et.al.

May 1967.

Abstract: Four computer programs for the engineering analysis or review of protective structures used for civil defense were tested and evaluated. Each of the programs was found to be useful if applied by an engineer familiar with the programs and their operation. The fallout program can be used with the best amount of experience and is suitable for research design or review of protective structures. The blast programs useful in research, design, and review require a background in dynamics, ultimate strength, plastic design, and familiarity with the programs. The fire program is most useful as a research tool to evaluate various types of construction, postattack buildings, and existing buildings. This program should be used by engineers familiar with the nomenclature and the basis for the analysis. Recommendations are made for modifications of input data sheets, supplementing input data instructions, extending existing programs, and implementing the programs.

(NSA:21:39156)

181) NP-16938 (R-539)

PREDICTING BLAST-INDUCED BODY MOTIONS OF A BURIED STRUCTURE WITH FOOTINGS.

Allgood, J.R. and Carter, W.O.

contd.....

Aug. 1967.

NMM/mau

Abstract: An approximate theory is presented for predicting the absolute and relative body deflections of shallow-buried shelters in order to provide the designer with a rational approach for selecting footing dimensions. The theory consists of two coupled parts, one that describes the motion of the free field and another that defines the motion of a model of the structure, its foundations, and the covering soil. Soil characteristics are represented by straightline approximations to the loading and unloading portions of the stress-strain diagram from a one-dimensional compression test. Incremental strains are integrated as the stress wave propagates down-ward to obtain the absolute free-field displacement at the elevation of the footings. Motion of the structure is represented by a single-degree-of-freedom analog. Empirical functions are used to represent footing reaction and arching in the differential equation of motion, which is solved with the aid of a digital computer. The results are compared with available test data; velocities and deflections agree reasonably well but the magnitude of the peak accelerations from the theory are larger than the corresponding measurements. Computations performed with the computer code indicate that surface loads above about 100 psi cannot be resisted if the maximum relative deflection between the footing and the floor slab is limited to 2 inches.

(NSA:21:36311)

182) ORNL-3378 (p.28-36)

RADIATION-DETECTION INSTRUMENTS AND COMPONENTS.

Oak Ridge National Lab., Tenn.

(In-ORNL-3378 INSTRUMENTATION AND CONTROLS DIVISION ANNUAL
PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 1, 1962.)

Feb. 1963.

(R)

Abstract: A transistorized monitor for beta-gamma or alpha radiation was designed and is being tested to determine whether the savings realized from a lower failure rate of the transistorized instrument make it more economical than a comparable vacuum-tube instrument even though its initial cost is higher. Two identical

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constant air monitors were installed in adjacent laboratories, and the difference in the count rate of the two monitors was measured by a difference monitor. The difference monitor was set to alarm at a difference of 250 counts/min, whereas a single monitor was set to alarm at 1250 counts/min to avoid alarms when temperature inversion occurred. An experimental model of the aerial monitor was modified to make it easier for the pilot to operate and observe the instrument while flying the airplane. A shelter monitor was also developed for civil defense use. The full-scale ranges of this instrument when used with the explosion-proof chamber designed for this use are 1, 10, 100, r/hr. A portable 12-v scaler was designed for surveying low-level radioactivity by river-survey teams. It is also useful for surveying ground surfaces. A neutron monitor was developed to monitor either fast or thermal neutrons in a low background. Studies were continued to develop a monitor which measures at a remote point the power or gamma flux, or both, in the central region of the reactor lattice. A high-current biplanar phototube was tested at the porthole of the ORR. Output current vs reactor power gave a replica of the curve previously obtained with a silicon solar cell. A scintillation-type alpha counter for counting smear samples was developed to produce an instrument having a lower fabrication cost than commercially designed units. A crystal-controlled pulse generator was designed for checking the calibration of linear and logarithmic count-rate meters. A high-voltage supply having an output of 500 to 1400 was designed. A power-supply regulator circuit was designed that permits construction of any one of 24 supplies. The cost of the standard fast-neutron counter with a built-in alpha source was reduced by redesigning the counter. The cost of the windowless flow-proportional counter was also reduced by redesign.

(NSA:17:14610)

183) ORNL-3365

PANEL DISCUSSION ON CIVIL DEFENSE, AMERICAN NUCLEAR SOCIETY ANNUAL MEETING WEDNESDAY EVENING JUNE 23, 1965, GATLINBURG, TENNESSEE.

Oak Ridge National Lab., Tenn.

Sept. 1965.

(f)

Abstract: The merits of an extensive civil defense program with respect to nuclear warfare are discussed. The economic, political, and technical ramifications of such a program are considered.

(NSA:19:44215)

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184) ORNL-3900, pp 150-81)

BIOLOGY AND MEDICINE.

Oak Ridge National Lab., Ten.

(In ORNL-3900 ANNUAL REPORT, 1964)

1964.

(f)

Abstract: Summaries of research and development results are presented on somatic effects of radiation, radiation genetics, methods and chemicals for reducing radiation injuries, molecular level and cellular level mechanisms, terrestrial and freshwater ecology, radiological physics and radiation instruments, and nuclear energy civil effects.

(NSA:20:16159)

185) ORNL-4288

ATTENUATION OF SHOCK WAVES IN LONG PIPES BY ORIFICE PLATES, ROUGH WALLS, AND CYLINDRICAL OBSTACLES.

Dresner, Lawrence and Chester, Conrad V.

July 1968.

(f)

Abstract: Exploratory measurements of the attenuation of shock waves in tubes by orifice plates, rough walls, and cylindrical obstacles are reported. The measurements were carried out in a four-inch shock tube driven by an explosive mixture of propane and oxygen. It appears possible to correlate the attenuation produced by obstacles placed in the flow with their Fanning friction factors. The orifice plates and cylindrical obstacles are very efficient attenuators.

(NSA:22:37906)

186) ORNL-1093

CIVIL DEFENSE RESEARCH AT OAK RIDGE NATIONAL LABORATORY.

Bresee, J.C.

1965

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(f)

Abstract: The technical feasibility and cost estimates of urban civil defense shelters are discussed. The tunnel-grid shelter concept is reviewed and design and engineering data are presented for a city in which one million people live. The interconnected tunnel grid could house all inhabitants and is based on the use of standard 8-ft-diameter reinforced concrete pipe with an 8-in wall. The tunnel would include bunk space for 4 adults every 6 ft, or 3500/mile. With all bunks folded back, walking space 5 ft wide would be available, and with one bunk folded down on aisle space of 3 ft and seating space for 4 in 6 ft would be provided. Forced air ducts, water pipes, and electrical power cables are located under the floor. The cost for an elaborate system with refrigeration and power plants was estimated at \$ 400 to \$500 per person and more austere systems could be built for \$300 to \$400 per person. A number of dual uses for a tunnel-grid shelter system are suggested that would help to minimize the cost. . . .

(NSA:19:20202)

187) ORNL-P-1098

ON THE CHOICE OF A FALLOUT SHELTER PROTECTION FACTOR.

Blizard, Everitt P. and others

1965.

(f)

Abstract: The appropriate magnitude for a fallout shelter protection factor is discussed. The decrease of radiation intensity, time, and recovery from radiation are considered. It was concluded that the principal uncertainty is whether the maximum damage in terms of increased probability in short-term lethality is the proper criterion for judging the undersirability of a certain radiation history.

(NSA:20:16733)

188) ORNL-P-3427

PROJECT HARBOR IN RETROSPECT

Bresee, J.C.

(f)

1966

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NMM/mau

Abstract: Possible changes in the results and conclusions of Project Harbor after four years are presented. Project harbor was a civil defense study sponsored by the National Academy of Sciences at Woods Hole, Mass. in Aug. and Sept. 1963. Changes might result from the international situation, advances in weapons and defense technology, and modified domestic priorities. Changes caused by changes in emergency organizations, emphasis on shelter concept, and increased recognition of the interdependence of ballistic missile defense and civil defense are discussed.

189) ORNL-TM-1381

ENGINEERING STUDY OF UNDERGROUND HIGHWAY AND PARKING GARAGE AND BLAST SHELTER FOR MANHATTAN ISLAND.

Perla, Harold F. et al.

Mar. 1966.

(f)

Abstract: An underground cross-town highway connecting the Lincoln and Queens-Midtown Tunnels in New York City was found to be feasible, either alone or in conjunction with an underground parking garage which could accommodate a large number of vehicles, for use as a blast shelter. The study indicates that at a reasonable cost increase the parking facility and access tunnels can also be made a suitable shelter against blast pressures and ground shock effects from nuclear detonations which result in 100 psi surface overpressure levels above the shelter. Because the depth of burial is suitable for resisting greater overpressure, greater resistance would be possible, at much less than proportional increase in additive cost. The facility in its present concept will safely house 1.8 million people for 30 days, and provide for access during a 15-minute warning period. This capacity is based on the access and bunking concepts presented. The latter provides for bunking 600,000 people during one shift in about 80 percent of the parking area, reserving the other 20 percent of the parking area, the traffic tubes, bunk storage areas, access drifts, and ramps for activities for the other 1,200,000 people. The construction of the cross-town highway and parking area for 30,000 cars is estimated to require approximately $4\frac{1}{2}$ years using conventional techniques and reasonable manpower levels. Through use of equipment and techniques that might be possible after intensive research and development, it is estimated that the same

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capacity facility can be constructed in approximately 3 years, after 3 years required for equipment research and development, at a substantial decrease in cost. Cost estimates, excluding rights-of-way and personnel supplies for emergency are included. Information on parking facility size and lane justifications and human factors are appended.

(NSA:20:16623)

190) ORNL-TM-1531 (Pt.1)

CIVIL DEFENSE RESEARCH PROJECT ANNUAL PROGRESS REPORT,
Mar. 1965-Mar. 1966.

Oak Ridge National Lab., Tenn.

Nov. 1966.

(f)

Abstract: Progress is reported on various aspects of civil defense including biomedical aspects, sociological aspects, and protective systems. Biomedical studies were conducted on contamination of foodstuffs, physiology of heat stress, the Pankah-Pump, and the hazards of nuclear warfare to sheltered populations. Sociological research included strategic interaction, dynamics of American national security attitudes, determinants of influentials' responses to communications about a negative contingency, and emergency planning and urban problems. Protective systems were considered for blast and shock waves, thermal threat to sheltered populations, and urban protection.

(NSA:21:6494)

191) ORNL-TM-1966

VARIATION OF SHOCK OVERPRESSURE WITH DISTANCE IN AN EXPLOSIVELY
DRIVEN SHOCK TUBE.

Dresner, Lawrence

Sept. 1967.

(f)

Abstract: Variations of shock overpressure with distance down a shock tube were calculated for the following two methods of driving a shock tube: rapid smokeless powder burning in a closed driver section confined with a breakable membrane, and detonation

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of an explosive gas mixture confined by a breakable membrane. Results were compared with results found by detonating a small amount of high explosive at one end of a tube far down the tube. Variations of shock overpressure of the three methods are indistinguishable if the total energy is the same in all methods. Near the end of the driver tube, shock produced by rapid burning smokeless powder and detonation of a gas explosive is unusual. This behaviour was analyzed and shown to be due to propagation of rarefaction waves through the gas behind the shock front. Numerical calculations explaining the flow process are discussed.

(NSA:21:43091)

192) ORNL-TM-2041

DEFENSE SYSTEM DESIGN MODEL.

Uher, R.A.

Feb. 1968. (f)

Abstract: A model is presented which optimizes strategic defense. Surviving population is considered the measure of the effectiveness of the defense system which can include active and passive elements. If the attack size and defense budget are specified, the model produces optimum active and passive defense mixes and allocates defense spending to regions of the United States according to population density.

(NSA:22:16701)

193) ORNL-tr-972

THERMONUCLEAR EXPLOSIONS AT GREAT ALTITUDE.

Pretre, S.

Reprint from Neue Zuercher Zeitung, Nos. 270, 271.

Jan. 1964. (f)

Abstract: The effects of nuclear explosions at altitudes >30 km are outlined. The case of a nuclear attack on Switzerland is treated as an example. Civil-defense measures are briefly considered, as well as counterstrike possibilities and the usefulness

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of antimissile weapons.

(NSA:20:14230)

194) ORO-SP-30

EFFECT OF POPULATION MOBILITY ON THE LOCATION OF COMMUNAL SHELTERS.

Michael, N. et.al.

Oct. 1957.

Abstract: Methods were developed for estimating the size of an area served by a civil defense shelter as a function of building types, walking speeds, queuing at shelter entrances warning and reaction times, and the percentage of population to be protected. A system of large communal shelters in urban areas, a 15-min warning, and a population trained in moving to shelters on foot are assumed. The results obtained were applied to Washington, D-C. Data on the number and capacity of shelters are tabulated.

(NSA:16:15025)

195) RM-2801-PR (AD-606326)

ECOLOGICAL PROBLEMS AND POSTWAR RECUPERATION. A PRELIMINARY SURVEY FROM THE CIVIL DEFENSE VIEWPOINT.

Mitchell, H.H.

Aug. 1961.

Abstract: The need for assessing and solving ecological problems in the post-attack environment as an integral part of civil defense is discussed. Basic ecological principles involving food chain relationship, climax growth, biological and environmental relationship, and land management are considered. The large-scale damage due to fire, drought, flood and other things has already presented the world with problems of reconstruction and reconstitution of biotic communities which are similar to those envisioned in the post-attack environment. The only qualitatively new element in the post-attack situation will be the effects of radiation. The available information on this subject is summarized and the need for extensive further research is pointed out.

(NSA:19:19504)

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196) RM-3902-TAB

NOTES ON THE ESTIMATION OF FIRE DAMAGE TO NON-URBAN AREAS FROM
NUCLEAR ATTACK.

Doner, J.E.

Oct. 1965.

(f)

Abstract: Early attempts to estimate the non-urban fire damage that would result from a widespread nuclear attack on the United States have, of necessity, depended heavily on the experience and judgment of fire suppression personnel. An elementary model was previously developed, but lack of knowledge about the very complex burning process of a forest fire and the tremendous number of inputs required for a nationwide study limit its accuracy and utility. Some possible approaches toward improving the model are suggested.

(NSA:20:1590)

197) RM-4238-TAB

FLOODS AND THE "POSTATTACK BIOLOGY PROBLEM". A PRELIMINARY SURVEY.

Mitchell, H.H.

Jan. 1965.

(f)

Abstract: Data are summarized on floods and flood damage in the United States. Health aspects of floods and human adjustments to floods are considered in the light of past experience. The possibility that devastating floods may be a consequence of the denudation of ground cover by fire and fallout following a nuclear attack is considered. An estimate is presented for the magnitude of flood problems during a post-attack period.

(NSA:19:11421)

198) RM-4968-TAB

PLAGUE IN THE UNITED STATES: AN ASSESSMENT OF ITS SIGNIFICANCE
AS A PROBLEM FOLLOWING A THERMONUCLEAR WAR.

Mitchell, H.H.

June 1966.

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Abstract: The modern pandemic of plague which started in China in 1855 brought this disease to the United States. Domestic rodents in several port cities having become infected, the disease spread to wild rodents, in which it has apparently become permanently endemic. Since 1900, over 500 human cases of plague have occurred in the United States. Although the total number of cases is small, and in recent years has declined almost to zero, the potential exists for a large-scale epidemic. Even a single case of bubonic plague can become pneumonic and start the human-to-human spread which may then involve large numbers of people. With the postattack environment in mind several suggestions for increased involvement of other government agencies have been recommended. The Civil Defense authorities should have accurate information about endemic plague foci, medical and public health personnel at all levels should be alerted and trained to handle plague-suspected incidents, and studies should be conducted on the best methods for combating plague should it occur in the postattack environment. Our knowledge of the disease and its epidemiology, along with modern methods of control and treatment, makes it highly unlikely that an epidemic will take place even in the disordered environment of a postattack situation. However, this possibility cannot be ruled out entirely if one wishes to assume a sufficiently serious breakdown of organized society as we know it today.

(NSA:20:43587)

109) R-OU-266

RADIOLOGICAL RECOVERY REQUIREMENTS, STRUCTURES, AND OPERATIONS
RESEARCH: INTRODUCTION AND SUMMARY.

Bryan, F.A., Jr.

May 1967.

Abstract: The primary objectives of this study were to develop procedures which may be employed to estimate the effect of limited strip of contamination for the optimum direction directed of decontamination operations, and to develop a procedure for obtaining estimates of the protection factor available in damaged structures by means of a multiplicative function. The results of the research in these activities are summarized, and general and specific conclusions and recommendations given.

(NSA:21:32344)

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200) R-OU-266 (Vol.I)

RADIOLOGICAL RECOVERY REQUIREMENTS, STRUCTURES, AND OPERATIONS RESEARCH. VOLUME I. CALCULATIONAL TECHNIQUE FOR DETERMINING IMPORTANCE OF LIMITED STRIP DECONTAMINATION PROCEDURES. :Final Report.

Dogget, W.O. & Bryan, F.A. Jr.

May 1967.

Abstract: A description of the CONSTrip III computer program is given. This program calculates the penetration of radiation from a uniformly contaminated horizontal rectangular source area through a shielding wall to a point detector. CONSTrip III differs from CONSTrip II in three major respects; the detector may be located at the rear surface of the wall as viewed from the source; calculations may be performed for a zero wall thickness (no wall present) and an option to incorporate the build up-air-attenuation factor for cobalt-60 on a concrete slab has been included. The method of summing contributions from source-patch, wall-slab combination is the same in both programs. The program is in good agreement with hand calculations and published experimental and theoretical results, and it is an improvement over previous techniques for solution of the barrier shield problem.

(NSA:21:32345)

201) R-OU-266 (Vol.2)

RADIOLOGICAL RECOVERY REQUIREMENTS. STRUCTURES, AND OPERATIONS RESEARCH - VOLUME II DAMAGED OF MULTIPLIER.

Johnson, T.

May 1967.

Abstract: The theoretical development and a demonstration of a damaged protection factor multiplier are presented. A multiplier of the form $e^{B_0 + B_1 X_1 + B_n X_n}$ is prepared for multiplying their undamaged protection factor after structural damage. The X_i represent such factors as loss of exterior wall mass, ingress of fallout, and loss of interior partitions. The variables selected explain a large fraction of the change in protection factor caused by damage to a structure. Methods of testing the model are presented.

(NSA:21:32346)

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202) E-OU-230-1

BUDGET ALLOCATION FOR SHELTER SYSTEMS. :Final Report.

McMullan P.S. et.al.

June 1967.

Abstract: A computer model which prepares optimum civil defense shelter postures built upon the base of the current National Fallout Shelter Survey is developed, programmed, and demonstrated. 'Optimum' can be based on the user-specified objective of either the level of risk by supplying an attack environment (both blast and fallout) which is used to calculate the probability of fatality (or casualty) for a person in each existing shelter and in each proposed shelter option in each standard location. Population is then assigned to existing and proposed shelter in an optimum manner, subject to the specified budget. The mathematical formulation is equivalent to a linear program. The model also permits an evaluation of shelter improvement programs against any user supplied attack environment. At the option of the user, the following inputs may be varied. Budget level, degree of risk of hazard, definition of shelter fallout or blast vulnerability, and cost per space of shelter. The model has been demonstrated using the state of Rhode Island. Illustrative analyses have been made of the effects of an error in judgment about attack environment, population data base (day or night) at the time of the attack, alternative measures of effectiveness (fatalities or casualties), etc. These cases demonstrate the availability of the model for its intended use in shelter system studies for the Shelter Research Division, Office of Civil Defense. The model will be used primarily in synthesis and analysis of "near future" shelter systems and can be modified for use in more comprehensive system studies (e.g. combined warning, movement, and shelter system studies) and cost-effectiveness evaluations.

(NSA:21:36313)

203) RTD-TDR-63-3049

BIOLOGICAL DOSIMETRY OF IONIZING RADIATION AS APPLIED TO TRIAGE OF CASUALTIES FOLLOWING A THERMONUCLEAR DETONATION.

Odland, L.T.

Oct. 1963.

contd.....

NMM/mau

Abstract: The need for sorting of casualties following a nuclear disaster is discussed. The problem of radiation illness imposed upon conventional traumatic injuries and burns is emphasized. Arguments are presented for the need of a simple yet accurate biological dosimeter to aid medical officers responsible for casualty sorting. Criteria of an ideal biological dosimeter are proposed, and developments are reviewed. It is pointed out that at present the fall in leukocyte count, especially the lymphocytes, following exposure is the simplest and most practical method of estimating biological injury resulting from ionizing radiation.

204) SC-4689(RR)

A RISK-ORIENTED APPROACH TO PROTECTION FROM NUCLEAR WEAPONS.

Vortman, L.J.

Sept. 1962.

(R)

Abstract: A rational approach is presented for providing protection from nuclear weapons in keeping with either a policy wherein the cost of protection is borne by the individual property owner or one wherein it is borne by tax-derived funds. All prompt effects, except the scattering of prompt radiation through entrances, are given in terms of overpressure from a 10-megaton burst by providing at each overpressure sufficient cover to reduce prompt radiation to an acceptable level inside. A low radiation level inside is recommended for new construction because its additional cost is insignificant. Scattering through entrances can be reduced to acceptable levels through proper baffling and entrance door design. The thesis is that each shelter owner must find a combination of cost and risk acceptable to him. A procedure is described for estimating risk from both fall-out and blast, the latter in terms of probability of each level of blast pressure in terms of distance from likely aiming points within a target area. While oriented toward the individual, the procedures are equally applicable for shelters in commercial, industrial, and public building. A concept of shelters and equipment in more than one price range is introduced to permit levels of comfort and convenience to fit the wishes of the owner without any significant sacrifice of basic protection.

(NSA:16:33314)

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205) TID-18504

VULNERABILITY OF ELECTRIC POWER SYSTEMS TO NUCLEAR WEAPONS.

Pilot Study-Region 1.

Oct. 1962.

(f)

Abstract: Development of a methodology to determine the vulnerability of electric power systems to nuclear weapon effects is described. The geographic area selected for the study contained power systems which normally serve the eight states comprising Civil Defense Region 1.

(NSA:17:21933)

206) TID-19126

INSTITUTE IN FUNDAMENTALS OF RADIATION AND RADIOLOGICAL PROTECTION.
:Final Report, June 9, 1962 through May 30, 1963.

North Carolina State College, Raleigh and North Carolina. University, Chapel Hill.

1963.

(f)

Abstract: An outline is presented of a course in the basic principles of radiological protection for public health officials and other personnel who have some specific responsibility for organizing, training, and providing for the protection of the public from the hazards of radiation. An evaluation is included of the effectiveness of the course in obtaining objectives after one year.

(NSA:17:31855)

207) TID-23348

PATHOLOGY OF DIRECT AIRBLAST INJURY. :Technical Progress Report.

Chiffelle, Thomas L.

April 1966.

NMM/mau

contd.....

Abstract: Blast injury is a complex and very hazardous phenomenon to the biologic target. Together with effects of thermal radiations from modern nuclear weapons, blast injury (direct and indirect) appears to be accountable for the vast bulk of early deaths and casualties in nuclear explosions. The important clinical, physiological, and pathological information concerning the effects of direct air-blast injury on the biologic subject are summarized. Certain features have been emphasized in order to assist the clinical medical officer towards proper management of casualties. A brief description of pulmonary sequelae of blast injury is included for completeness.

(NSA:20:42710)

208) TID-23942

PREDICTING THE UNPREDICTABLE. PROBLEMS IN ESTIMATING THE BIOLOGICAL AND ENVIRONMENTAL CONSEQUENCES OF NUCLEAR WAR-II.

Hal, Hollister.

April 1967.

(f)

Abstract: Problems encountered in estimating the biological and environmental consequences of intercontinental thermonuclear warfare are reviewed. It is pointed out that it is essential for the people of the United States to acquire some understanding of what an all out nuclear attack may mean in order to decide the extent civil defense preparations necessary for minimizing damage and improving prospects for recovery and the determine whether or not such preparations can be made without undermining the values of a free society. Contrasting points of view are discussed on whether or not national survival and recovery would be possible, even though a significant number of persons are protected from the initial blast, fire, and radiation. The economic, political, social and psychological impacts of nuclear warfare, as well as the effects on disruption of the biosphere are considered.

(NSA:21:39407)

209) TO-B-63-40

ANGULAR DISTRIBUTION OF SKYSHINE RADIATION AT THE SURFACE OF A PLANE OF FALLOUT CONTAMINATION.

Starbird, Albert W. and Better, John F.

Mar. 1964.

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NMM/mau

Abstract: An experimental program was conducted to determine the angular distribution of the air-scattered component of gamma radiation (skyshine) at the surface of a plane of fallout contamination. Measurements were made by placing a radiation detector in a vertical collimator recessed flush with the ground surface and placing cobalt-60 sources on the ground along a line extending from the center of the collimator to a radius of about 40 ft to simulate fallout contamination. Detector depth in the collimator was varied to measure skyshine within the cone formed by the collimator opening and the detector at given solid angle fractions for source positions extending from the collimator lip to the 40-ft radius. The experimentally determined results of this program and of other investigators were compared with theoretical calculations. It was concluded that calculated accumulative angular dose rate distributions of skyshine from point and plane sources are probably valid. Analytically derived curves for total scattered radiation for cobalt-60 and cesium-137 underestimate dose rates from close-in sources and slightly underestimate them from distant sources when an earth or asphalt interface is substituted for free or compressed air values. The analytical equation for calculation of total skyshine is reasonably accurate.

210) TO-B-63-76

THE EFFECT OF LIMITED STRIPS OF CONTAMINATION ON THE DOSE RATE IN A MULTISTORY, WINDOWLESS STRUCTURE WITH 40-PSF WALLS AND 50-PSF FLOORS.

Starbird, Albert W.

Oct. 1963.

Abstract: The effects of limited rectangular fields of contamination the dose rates within multistory structures were evaluated for a structure with 40 psf walls and 50 psf floors. Comparisons were made between experimentally determined results and those obtained through use of the OCD Guide for Architects and Engineers, the National Shelter Survey Computer Program, and the OCD manual entitled, The Design and Review of Structures for Protection from Fallout

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Gamma Radiation. Recommended experimentally obtained multiplicative correction factors for accounting for limited strips of contamination are presented. Good agreement was obtained ~~between~~ experimentally measured and computed infinite-field above ground dose rates and for basement rates at a 5-ft to 6-ft depth only. Basement measured dose rates were higher than computed values at greater depths.

211) TO-B-67-25

THE USE OF SCALE MODELS IN STRUCTURE SHIELDING EXPERIMENTS -
:Final Report, Jan.3, 1966 to Dec.17, 1966.

Kaplan A.L. and Koeppe-Baker, N.B.

April 1967.

Abstract: Aspects of scale model shielding data used to predict the shielding effectiveness of full-scale structures were studied. Among the problems considered were the estimate of the far-field contribution and the application of model data to the corresponding full scale structure. Work results showed that for these two operations, separate treatment of the skyshine and non-skyshine components of the dose rates in the model structure produces good agreement with experimental and theoretical results for full-scale structures. This agreement is significantly better than that obtained by using the total dose rates to perform these operations, as was done in the earlier methods of handling model data. In considering the materials, used in model structures, it was found that the use of steel in model experiments on a psf basis to simulate concrete in the full-scale structure produces no differences in barrier reduction, within experimental accuracy, up to a barrier thickness of 150 psf. The results of the evaluation of methods for designing and carrying out scale-model shielding studies and applying the results of the studies to full-scale structures indicate that scale-model experiments can be used to predict the shielding effectiveness of corresponding full-scale structure to within 10%.

(NSA:21:36314)

212) UCRL-Trans-10197

NUCLEAR WEAPONS AND DEFENSE AGAINST THEM.

Mikhailov, V. and Naumenko, I.

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1967

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(f)

Abstract: The history, physics, and principles of fission and fusion weapons are summarized. Formulas for protective shelters are reviewed. Methods for predicting radiation using templates, protection from light of radiation from nuclear explosion, and radiation hazards from nuclear explosions are reviewed.

213) URS-639-9

EFFECTS OF FIRE ON STRUCTURAL DEBRIS PRODUCED BY NUCLEAR BLAST.

Rotz, J. et.al.

Research Report.

Jan. 1965.

Abstract: A study was conducted to evaluate fire effects on debris produced by nuclear weapons. The magnitude of fire from nuclear weapons as a major agent of destruction is discussed. The aftermath of blast and fire is then evaluated in terms of debris. Fire effects on specific types of structures are discussed with respect to determination of resulting changes in debris quantities. Data from major fires are used to augment this portion of the study. The percent of debris vs overpressure curves (developed in the first phase of the program to predict the amount of debris formed by air blast) are altered to reflect the coupled effects of blast and fire. An example employing data, techniques, and knowledge developed in the program is presented. This takes the form of determination of debris depths along a route through a stricken city.

(NSA:19:26519)

214) URS-651-4

FORMATION OF DEBRIS FROM BUILDINGS AND THEIR CONTENTS BY BLAST AND FIRE EFFECTS OF NUCLEAR WEAPONS. :Final Report.

Rotz, J. et.al.

Apr. 1966.

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Abstract: Debris charts, failure overpressure data, contents-debris criteria, and estimating procedures are presented to facilitate application of the debris prediction model and increase its range of applicability. A description of the debris prediction model and its operation and a detailed worked example are presented illustrating the use of the model to determine debris contours over the entire city of Detroit and debris profiles along a route through the city. In this example, debris depths before and after fire and the percentage contribution by building contents and structural components in each case are given.

(NSA:20:31332)

215) USNRDL-TR-582

DESIGN MODIFICATIONS AND 1962 COST ANALYSIS FOR A STANDARDIZED SERIES OF FALLOUT SHELTERS.

Porteous, Lewis G.

Sept. 1962.

Abstract: Major emphasis is on recent design modifications and 1962 cost estimates for the personnel fallout shelters described in USNRDL-TR-366, Specifications and Costs of a Standardized Series of Fallout Shelters (1959). The shelter is designed to accommodate at least 100 persons for 14 days. It is believed that the shelter will provide the specified fallout and blast protection, the required interior environment, and the essential hotel-type equipment at minimum cost. The shelter items are specified by several packages, each having one or more different arrangements of items, depending on the degrees of protection and comfort desired. The proper selection of packages will result either in a 35-psi or 10-psi blast and fallout shelter sited above or below grade. The radiation protection factor is at least 1000. Most austere to least austere living accommodations can be selected. Average cost data for the packages by item are tabulated for quantities up to 1000. Respective costs for four complete shelters, combinations of most austere and least austere with 35-psi and 10-psi, have been estimated and are presented graphically. Costs for shelter quantities were estimated by means of learning curves. The cost range from \$19,800 for the least-austere 35-psi shelter to \$14,200 for the most-austere 10-psi shelter. The design modifications are based on findings of the USNRDL Shelter Research Program for the period, 1959 to June 1962. Drawings are included.

..(NSA:17:6324)

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216) USNIDL-TR-647

THE DESIGN AND PERFORMANCE OF A FALLOUT-TESTED MANNED SHELTER
STATION AND ITS SUITABILITY AS A SINGLE-FAMILY SHELTER.

Sartor, J. et.al.

April 1963.

Abstract: The design details, cost analysis, and performance characteristics are presented for small, partially-underground fallout shelters utilized as manned stations during a nuclear weapon effects test. Four men occupied each shelter and operated radiation measurement and fallout collection instruments. Two types of shelters were designed to withstand predicted overpressure: Type I for a 1-psi overpressure and Type II for a 5-psi overpressure. The basic structure consisted of an 8-ft diameter, 10-ft long, 12-gage corrugated steel, multi-plate pipe. A steel entranceway incorporating two right-angle turns provided access to the basic structure. Depending upon the amount of soil backfill, fallout gamma radiation protection factors up to 470,000 were obtained. The overall performance of the shelters under the conditions experienced was excellent. It is suggested that shelters of this type have application not only for use as manned stations in nuclear weapon testing but can be adapted as well for use in residential areas as single-family fallout shelters.

(NSA:19:22517)

217) USACDCNG-62-5(Rev.)

FALLOUT FROM MULTIPLE SURFACE BURSTS.

Army Combat Developments Command. Nuclear Group, Fort Bliss, Tex.

May 1964.

Abstract: The effects of receiving fallout from more than one source on decay and total dose calculations and predictions are discussed. The adaptability of the current Army fallout prediction system to the multiple surface burst fallout situation is examined. Simple procedures for the estimation of cumulative radiation dose are suggested for use in field situations.

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218) USNRDL-TR-570

RADIOLOGICAL RECOVERY OF LAND TARGET COMPONENTS-COMPLEX I AND
COMPLEX II.

Owen, "I.L. and Sartor, J.D.

May 1962.

Abstract: Facilities escaping physical damage from a nuclear attack still may have to cope with hazardous amounts of fallout material. The survival of personnel and the resumption of vital missions could depend upon the timely removal of the fallout deposits. The safe performance of such a removal effort is possible only if a detailed radiological recovery plan exists before attack. Two closely similar experiments were conducted on the operational recovery of an artificially contaminated land target complex. In each case a suitable recovery plan was formulated and then executed. The results showed that, within prescribed dose limits, pre-attack planning of a radiological recovery operation is not only feasible but strongly recommended.

(NSA:17:3233)

219) USNRDL-TR-585

A METHOD FOR DETERMINING MISSION RE-ENTRY TIMES FOR FALLOUT-CONTAMINATED
INDUSTRIAL COMPLEXES.

Lee, H.

March 1962.

Abstract: In the event of a nuclear war, knowledge of the time of availability, after contamination by fallout, for re-entry and use of certain resources is important in planning and preparing for the nation's recovery. This study is limited to the estimation of the availability time for industrial complexes that are not physically damaged by the attack or by emergency shut-down, but are inaccessible because of radiological contamination by fallout. A method of calculation proposed to be suitable for all industrial complexes was applied to five petroleum refineries. The findings were that the dose to decontamination personnel is the primary factor limiting re-entry and use. For the standard intensity range of 100 to 30,000

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r/hr and dose limits of 30 r/24 hr, 230 r/2 wk and 1,000 r/yr, the mission re-entry time for the refineries studied ranged from 1 to 35 days.

(NSA:17:3234)

220) USNRDL-TR-656

RECOVERY OF PETROLEUM REFINERIES CONTAMINATED BY FALLOUT.

Minvielle, L. and Van Horn, W. H.

June 1963.

Abstract: The Office of Civil Defense, Department of Defense, is sponsoring a series of studies on the recovery of certain essential major industries in the U.S. from the effects of nuclear attack. Various agencies are developing recovery input data that will eventually be fed to automatic computers to prepare production programs, consistent with surviving resources, for meeting priority requirements during the first two years after attack. The present study deals with the petroleum refinery industry.

(NSA:17:39318)

221) USNRDL-TR-659

CIVIL DEFENSE UTILIZATION OF SHIPS AND BOATS.

Van Horn, W.H. & Freund, D.

July 1963.

Abstract: Various ways in which ships and boats might supplement the over-all civil defense program were investigated. Both merchant and reserve fleet ships were considered for the part they might play in a lifesaving, life-sustaining civil defense capacity. Data for two port cities were analyzed to obtain information on population distribution and shipping activity. Engineering feasibility studies were made of the use of ships as personnel shelters and the availability of ships' utilities for use by shore installations. The protection offered from nuclear fallout radiation was calculated for two classes of ships. It was concluded that ships and boats could provide evacuation or fallout-shelter facilities, or both,

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before or during a nuclear attack. For the postattack situation, ships could serve as headquarters, hospitals, living quarters, storehouses, and prime producers of electrical power and potable water. It is recommended that further studies be made of selected port cities to determine how ships and boats could best be used to supplement present civil defense capabilities of these cities.

222) WT-792

EFFECTS OF AN ATOMIC EXPLOSION ON TWO TYPICAL TWO-STORY-AND-BASEMENT WOOD-FRAME HOUSES.

Byrnes, Joseph B.

Project 21.2 of OPERATION UPSHOT-KNOTHOLE.

Sept. 1953.

(R)

Abstract: The effects of an atomic explosion on typical two-story wood-frame houses and occupants thereof were demonstrated. Two houses with basements were located 3500 ft and 7500 ft from ground zero of a 16.4-kt atomic bomb exploded at 300 ft above the ground during operation Upshot-Knothole. Both houses were furnished and mannequins were placed in the dining and living rooms. Visual inspection and photography were utilized to study thermal radiation and blast effects, and film badges were placed throughout the houses to measure γ radiation. Mannequins in both houses were thrown about and severely damaged by flying glass and debris, and those in the house located at 3500 ft were broken and trapped in debris. The exterior wood on the front of the house at 3500 ft was charred from thermal radiation, the first story disintegrated, the roof and chimney broke, and other sections of the house were moved off the basement walls. The house at 7500 ft was slightly scorched, windows and doors were broken, and the house was badly damaged inside. Heavy fallout delayed the recovery of the film badges and initial γ radiation was not determined. Results indicated that a conventional wood-frame house will be severely damaged at an overpressure of 2 psi and will be destroyed at 5 psi. Damage to mannequins indicated that human beings without shelters would have been killed or seriously injured in the house 3500 ft from the blast and would have been injured in the house 7500 ft from the blast.

(NSA:17:37016)

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223) WT-801

EFFECTS OF AN ATOMIC EXPLOSION ON UNDERGROUND AND BASEMENT TYPES OF HOME SHELTERS.

Byrnes, Joseph B.

Oct. 1953.

(f)

Abstract: Underground earth-covered shelters were exposed to a 16.4-kt, 300-ft tower shot at ranges of 1230 ft (one), 1450 ft (one), 1800 ft (five), and 3500 ft (one). Two types of basement shelters were constructed in each of the test houses at 3500 and 7500 ft. Instrumentation was by gamma radiation badges, paraffin cubes, and nylon swatches. Attempts were made to measure permanent deflections of concrete roof slabs. Mannequins were placed in several shelters for purposes of demonstration and observation of blast-caused movement. A weighted mannequin in the underground shelter at 1230 ft was broken in half; an unweighted one (child size) was thrown to the floor. All other mannequins remained in place, undamaged. Paraffin cubes and nylon swatches showed no evidence of thermal damage. Fallout conditions made it impossible to determine initial gamma-radiation quantities. There was no cracking or permanent deflection of the concrete roof slabs. Except for a wood-covered, trench type shelter, which partially failed because of faulty construction, the shelters showed no blast damage. Thermal energy entering the shelters probably would not have caused skin burns to human occupants. Adequacy of the shelters under full design loads could not be determined because pressures were lower than expected, but the shelter designs were structurally acceptable under test pressures received.

(NSA:17:29880)

224) WT-808

(f)

EVALUATION OF TRAINING PROGRAM FOR RADIOLOGICAL DEFENSE PERSONNEL.

Lamoureux, V.B.

Dec. 1953.

Abstract: Field training was provided under actual nuclear explosion

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conditions for State and local civil defense personnel engaged in radiological defense planning. Selected trainees reported to the Nevada Proving Grounds where they completed a course of lectures and field exercises. All trainees were given security clearance to permit access to restricted areas and freedom of discussion with program directors, project officers, and other test officials. The trainees received background information useful to them in their preparation of radiological defense plans in their home states and communities.

(NSA:17:30758)

225) WT-1449

RESPONSE OF DUAL-PURPOSE REINFORCED-CONCRETE MASS SHELTER.
Project 30.2 of OPERATION PLUMBBOB.

Cohen, E. et al.

April 1961.

(R)

Abstract: A reinforced-concrete dual-purpose underground parking garage and personnel shelter designed for a long-duration incident pressure of 40 psi was tested. The shelter was exposed to shot Priscilla, an approximately 37-kt 700-ft balloon burst (June 24, 1957), at a ground range of 1600 ft (predicted 35-psi peak incident-pressure level). The recorded peak incident pressure at the shelter was approximately 39 psi. Postshot soil borings were made to obtain undisturbed samples for determining soil characteristics. Preshot and postshot field surveys were made to determine the total lateral and vertical displacement of the structure. The test structure provided adequate protection from the effects of the test device at the test GZ distance. Despite failure of the door sealing gasket, a rise in pressure in the interior did not exceed 1.0 psi. The flat-slab roof and supporting structure were more than adequate to resist the 39-psi peak incident test loading.

(NSA:16:29250)

226) WT-1462

PROTECTION AGAINST FALLOUT RADIATION IN A SIMPLE STRUCTURE.

Project 32.1 (of) Operation PLUMBBOB.

Breslin, A.J. et al.

1962.

(R)

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Abstract: A reinforced Butler building was exposed to fallout from Shots Diablo and Shasta, and the resulting dose rates and fallout deposition inside and outside the structure were measured with various instruments and techniques. Protection factors and roof and ground contributions to the total dose rates at points within the structure were determined from the measurements. Comparisons were made with the results of theoretical and other experimental studies. Information obtained from this experiment should be of value as basic experimental data for fallout protection work, although it is recommended that additional substantiative data be obtained under more controlled conditions.

(NSA:17:31804)

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PART C: BOOKS, PERIODICAL ARTICLES etc.

- 227) Abdullah, Mohamad.

CIVIL DEFENSE AGAINST ATOMIC ATTACK: TECHNIQUES AND ORGANIZATION OF NURSING CARE FOR VICTIMS OF ATOMIC EXPLOSIONS.

Madjalah Kedokteran Indones., 10: 299-305 (Aug. 1960)

(NSA:17:19771)

- 228) Albright, Gifford H.

PLANNING ATOMIC SHELTERS: A GUIDEBOOK FOR ARCHITECTS AND ENGINEERS.

University Park, Pa, Pennsylvania State University Press, 1961.

Abstract: Information is presented which enables architects and planners to plan effective integrated shelters as a part of the design of selected building types. Basic principles of the philosophy of protection, the philosophy of integrated convertible shelters, weapons effects, and architectural planning are discussed as back-ground for planning analyses and concepts for integrated convertible shelters. It is concluded that integrated convertible shelters can be incorporated within conventional spaces of buildings without decreasing the efficient performance of normal functions or creating windowless monstrosities, and at little or no increase in cost. The following building types are used as demonstration: barracks, training school, administration building, 100 bed hospital, subsistence building, and communications building.

- 229) Ballantyne, E.E.

CONTROL OF FOOD SUPPLIES EXPOSED TO FALLOUT.

Can. J. Public Health, 54: 262-6 (June 1963).

Abstract: The control of food supplies that may be contaminated by a nuclear-bomb detonation is discussed. Both the short and long-term situations are reviewed in terms of a post-attack recovery program. The emergency plan to safeguard food supplies and the necessary quarantine procedures to assure a safe, wholesome food supply are analyzed.

NMM/mau

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230) Baltrukiewicz, Zenon.

SOME OF THE MEDICAL PROBLEMS FOLLOWING A NUCLEAR ATTACK.

Lek.Wojsk. No.11, 973-81 (1966) (In Polish)

Abstract: Selected medical problems of a thermo-nuclear war, in particular, the immediate results of a nuclear attack are discussed. It is pointed out that in spite of general opinion the main causes of injury during the initial period after the attack and within a large radius of the zero point are not due to nuclear radiation but rather due to the effect of fire and shock waves. Losses resulting from the blast will be mainly due to the excess pressure, and will manifest themselves as bursting-tympanic membranes and lungs. Tumbling building and objects flying tens of kilometers away will be the next cause of injuries. Thermal radiation, mainly infrared radiation, will result in body burns and ignition of inflammable materials in the range of many kilometers. The duties of the health service during that period will consist in the selection of the injured who should and still can be helped. These will include patients with surface burns, damaged retina and pulmonary system, torn soft tissues and broken bones, and radiation sickness. During the subsequent period, the efficient combat of sanitary-epidemic problems will be of great importance. Due to the fact that in the case of a thermo-nuclear attack there will be no clear division between the front line and rear or safety region, the evacuation concept will be useless and all available help should be directed to the activity on the spot. Psychological effects of the attack as well as their treatment are discussed briefly.

(NSA:21:45688)

231) Baratov, G.F.

CIVIL DEFENSE AGAINST ATOMIC, CHEMICAL, AND BACTERIOLOGICAL ATTACK.

Kiev, State Medical Publishing House, Ukrainian SSR, 1962. (In Russian)

Abstract: Data are given on various types of air attack and principles and performance of various nuclear, chemical, and bacteriological weapons. Protection against ionizing radiation in handling radioactive material and source is discussed. First aid measure, therapeutic prophylaxis, quarantine, dissection, and other measures

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applicable in civilian protection against nuclear and thermonuclear attack are considered.

(NSA:17:20274)

232) Barton, Charles W.

DISASTER PLANNING FOR THE HOSPITAL ENGINEERS.

Hospital 36:61-9, Oct.16, 1962.

Abstract: Civil defense planning for hospital maintenance is reviewed, especially with regard to continuation, during an attack, of water distribution, sewage facilities, and electric supply for emergency power, light, and refrigeration.

233) Baschiere, E.J.

ANALYSIS OF ABOVEGROUND FALLOUT SHELTER VENTILATION REQUIREMENTS.

Amer. Soc. Heat., Refrig. Air-cond. Eng. J., 71:101-14 (1965)

Abstract: In selecting the ventilation equipment for an aboveground fallout shelter, it is necessary to know the number of shelter occupants, the geographical location, and the shelter size and construction. The number of occupants establishes the level of latent heat produced in the shelter. Geographical location determines the ambient weather from which a weather design criteria can be obtained. The physical size and construction defines the heat transfer coefficients required to compute heat transfer to and from the shelter. An analytical model was determined for predicting psychrometric conditions that develop in above ground.

234) Batter, John F.

THE ATTENUATION OF IN-AND-DOWN SCATTERED RADIATION.

Trans. Amer. Nucl. Soc., 8: 652-3 (Nov.1965).

235) Becker, Harry G.

INDUSTRY'S ROLE IN CIVILIAN DEFENSE

J. Occupational Med., 5: 297-300 (June 1963)

Abstract: The preparation and organization of civil defense at the Industrial level are discussed.

NMM/rau

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236) Bellamy, Albert W.

STOCKPIILING TO SURVIVE A NUCLEAR ATTACK.

Science, 138: 958-60 (Nov. 30, 1962)

Abstract: An adequate civilian defense system has two phases. The first phase demands special structures, including stocked fallout shelters throughout the country and a maximum number of blast-resistant structures in and near population centers, with adequate instruments for detecting and measuring air pollutants and maintaining communications. The second, or recovery, phase requires stockpiling of fuels for operating farm machinery; power sources (fossil or nuclear) for rebuilding the nation's industrial plant; and, above all, stockpiling of food to keep human beings alive and functioning.

(NSA:17:3251)

237) Bentz, Richard. et al.

SOME CIVIL DEFENSE PROBLEMS IN THE NATION'S CAPITAL FOLLOWING WIDESPREAD THERMO-NUCLEAR ATTACK.

Operations Research, 5: 319-50 (June 1957)

Abstract: The probably conditions in Washington following widespread thermonuclear attack are assessed with respect to: radiation conditions in the city itself and in the nation's capital. Mock attacks with thermonuclear-size bombs were made on all targets designated as critical by the FCDA within a 300-mile radius of Washington. Appropriate fall-out contours were selected and oriented as to wind speed and bearing for each target. The attacks were repeated 36 times using a random sample of actual 60,000-ft wind readings. Radiation levels for the area were then compiled in terms of the percent of time a given two-day accumulated dose would be exceeded. An attack day was selected at random and the effects of blast heat and local (close-in) fall-out in Washington were added to indirect radiation effects. A comparison of the amount of time a rescue worker would have to wait (impeded by debris and radiation) to enter an area with the amount of time left to a survivor in shelter attenuating 0.9 of radiation effects was made. An area exists, in Virginia, where less than 200 r can be expected a large percent of percent of the time. A very small percentage of the target popula-

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tion will survive to be cared for in this area. It was found that present shelter is not adequate to prevent intolerable numbers of deaths. Present 'evacuation areas' should be re-evaluated in terms of likely radiation conditions.

(NSA:16:13404)

238) Bergelin, S.E.

CIVIL DEFENSE SHELTERS AND THEIR EXPLOITATION.

Tidskr. Mil. Halsovard, 86: 273-80 (1961)

(In Swedish)

Abstract: Public shelters in Sweden are concentrated in the largest cities and have a capacity of 110,000 sitting accommodations. These shelters are to be made more suitable for long-time occupancy and it is calculated, with a space of 1.5 m² per person. Public shelters for an additional 50,000 persons (1.5 m² per person) are now proposed to be built. These, as well as the old shelters, are intended for that part of the inhabitants who must remain behind at their work in central parts of the 14 biggest cities after final evacuation. These shelters shall withstand an overpressure of 10 atm. The standard shelters have room for a little more than 2 million sitting accommodations. Also, these shelters must be so equipped that they can be used for long-time occupancy and with a space of 1.5 m² per person. Every year standard shelters are built for about 125,000 persons. The building of a new and improved type of standard shelter will commence in July, 1961. They are to be proportioned with a space of 1.5 m² per person (after emergency evacuation has taken place) and have to stand an overpressure of 0.5 atm.: in places probable of becoming atom-bomb targets, an overpressure requirement of 1 atm. will be attained. The extensive building of shelters in Sweden has been economically possible owing to the shelters being used also for peacetime purposes.

(NSA:19:1823)

239) Berner, Jorgen H. Jr.

THE MANAGEMENT OF MASS CASUALTIES.

Tidsskr. Norske Lægegoren., 83: 932-5 (June 1, 1963)

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Abstract: The possible consequences of a nuclear war and the enormous casualty problems are discussed. In preparing for such emergency a general plan is discussed which makes possible, from the point of view of total defense, an approach to the problems which could arise. There will be a severe disproportion between resources of personnel and material and the requirements for treatment of casualties. Resources must be increased as far as possible, a rigorous economy is necessary, and demands must be reduced. Co-operation between the civil and military health authorities must be further extended. The injured must be sorted according to a definite system and this sorting must aim at groups of injured with different priorities for further evacuation chain must be organized in which all the medical units both military and civil, together with civil hospitals, act as links in the chain. All treatment must be standardized, first aid at the place of injury as well as surgical treatment at larger treatment centers. Essential emergency equipment must be standardized and stored. Certain groups of personnel will have to be given tasks which they would never be given in peacetime and therefore require additional training in peace time. Special treatment teams should be established to be selected and trained during peace time.

240) Berzins, Otto.

NUCLEAR WEAPONS.

Hart Publishing Co., Inc., 1967.

Abstract: The effect of nuclear weapon explosions and steps which may be taken to minimize the effects of radiation from such explosions are discussed. Elementary facts about nuclear energy, general principles of nuclear weapons, typical nuclear explosions, blast waves from nuclear explosions, thermal and ionizing radiation, and protective measures against the effects of nuclear explosions are discussed. Collective and individual blast and fallout shelters are illustrated and reviewed.

241) Bilecki, Swietoslaw.

RADIOACTIVE FALLOUT AND PREPARATION OF A FARM FOR SHELTER FROM IT.

Med. Weter. 20:245-6 (1964)

Abstract: The production of fallout by a nuclear denonation and its

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characteristics are described, and means by which farmers can protect themselves and their livestock from fallout are discussed. Radioactive fallout from air blasts of intermediate intensity can result in irradiation dose rates of 10R/hr over an area of 350 km^2 , and one R/hr over an area of 900 km^2 (0.5R/hr up to 1600 km^2). The rain fallout zone can be predicted sufficiently accurately by civil defense personnel to permit warning of the population. Since radioactive material can be incorporated in people and animals through breathing and through food and water intake, farmers, should prepare for the hazards of radioactive fallout. The farmer should prepare ~~his~~ **his** cellar he should prepare a shelter with the use of as heavy shielding material as he can obtain. Food, water, and other supplies for a two week period should be put in the shelter. He should also be prepared to clean the hides of his livestock from contamination. He should have a radio available. Barns should be prepared through such measures as banking earth around the walls of the barn. Food and water should be available in the barn, and should be covered with a tarpaulin. The farm well should also be covered or if water is taken from the river, it should be collected before fallout occurs. Feeding of cows should be decreased, their water intake minimized, and calves left with the cows to minimize milking requirements.

(NSA:21:8825)

242) Braucher, Charles L.

MISSION OF THE PHARMACIST IN NUCLEAR DISASTER.

Military Med., 131:234-44 (Mar.1966)

Abstract: The role of the pharmacist in caring for casualties of thermonuclear war is outlined and an estimate is made of the extent to which medical and pharmaceutical services would be disrupted by detonation of thermonuclear weapons in and near Oklahoma City. The physician and pharmacist survival rates would be about the same in an air explosion of both low and high-yield nuclear weapons over the center of Oklahoma City. With a 20-kiloton weapon the survival rate would approximate 90% while a 20-megaton weapon would allow a survival rate of about 0.5%. A survival differential would occur after detonation of a 1-megaton weapon over the Oklahoma City center, whereby 19.5% of the physicians and 41.7% of the pharmacists would survive. In the event of a 20-megaton explosion over the center of Tinker Air Force Base, the pharmacist survival rate (37.1%) would be more than triple that of the physician (11.9%). These survival

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rate differentials are caused by the scattered distribution pattern of pharmacists compared with the centrally grouped distribution pattern of physicians throughout the Oklahoma City metropolitan area. Medical service supplied by physicians would be seriously disrupted or almost completely curtailed, depending upon an enemy's choice of nuclear weapon and its target. This study reveals that at least one paramedical group, the pharmacists, because of their greater dispersion generally have a higher survival rate than physicians. This means that the pharmacist, under certain conditions, could more than double the postattack available medical manpower when compared with physicians alone. The pharmacist's primary mission in nuclear disaster would be a life-saving mission. Consequently, he must be prepared to assume emergency duties which ordinarily be performed by physicians. A pilot training program should be established for pharmacists in advanced emergency medical procedures.

(NSA:20:33583)

243) Brewer, Carey.

ROLE OF THE OFFICE OF EMERGENCY PLANNING.

Health Phys., 9: 545-9(May 1963)

Abstract: A national state of readiness must be achieved and maintained for the mobilization of the Nation to deal with all degrees of emergency such as cold war, limited war, and general war including attack upon the United States. National security and current economic action should be mutually supporting with due attention directed to emergency preparedness measures which will contribute to the improvement of our current economy or national well-being. The acceleration of mobilization can be accomplished most effectively and efficiently through the performance by departments and agencies of Government of those emergency preparedness function related to their established roles and capabilities. The responsibility for emergency preparedness involves virtually every department and agency of the Federal Government, and there is a need to provide a central point of leadership and coordination in the Executive office of the President. Therefore, the Office of Emergency Planning (OEP) was formed to advise and assist the President in the coordination and in the determination of policy for the emergency plans and preparedness assignments of the Federal departments and agencies designed to make possible the mobilization at Federal, State and local levels of the human, natural and industrial resources

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of the Nation to meet all conditions of national emergency. OEP is responsible for the preparation of plans and preparedness programs with respect to organization and the functioning of the Federal Government under mobilization conditions and with respect to specific areas of emergency Federal activity necessary in time of war which are not performed in the normal operations of the regular departments and agencies. OEP also exercises its assigned statutory operating functions relative to defense production, stockpiling, and development and maintenance of the mobilization base.

(NSA:17:24753)

244) Bruce, M.E.

CIVIL DEFENSE IN THE FOOD INDUSTRY. PART 5. MAINTAINING THE FOOD SUPPLY UNDER NUCLEAR ATTACK.

Food Technol., 16:34-7 (Mar. 1962).

Abstract: Discussion is given on the role of U.S. Department of Agriculture under the National Food Plan.

(NSA:16:33326)

245) Brucer, Marshall.

WHEN DO YOU LEAVE A FALLOUT SHELTER.

J.Am.Med. Assoc., 180: 144-6 (Apr. 14, 1962)

Abstract: A simple means for detecting unsafe levels of fallout, which would result from a thermonuclear explosion, is described. In the absence of more accurate metering devices, this would aid in determining when fallout shelters could be left. The sources, characteristics, and types of fallout are briefly discussed, and the effects of blast and thermal, neutron, and radiation produced by a nuclear explosion are enumerated. The radioactivation of various elements in the human body exposed to such an explosion by the released neutrons is considered.

246) Charles, E.B.

RADIOLOGICAL DEFENSE IN TEXAS.

Texas State J. Med., 60: 31-3 (Jan. 1964).

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Abstract: Civil defense in Texas is organized under the Radiological Defense Program (RiDEF), which is concerned with increasing the survival rate after a nuclear attack. The mission of RiDEF in Texas is: to plan and direct actions that can be taken to decrease the number and degree of radiation casualties; to reduce or eliminate the harmful effects of radiation contamination and exposure after survival; and to reduce or eliminate contamination in later periods of local and national rehabilitation. The organization has established these statewide capability objectives: to organize, train, equip, and direct a force capable of using effective measures against radiation hazards created by nuclear explosions; to predict areas of fallout with corresponding fallout zone radiation levels, and to inform the people within each area of existing dangers and how they can best protect themselves; to monitor areas to determine radioactive contamination; and to establish ways to protect food and water, and to decontaminate and dispose of radioactive materials. Local leadership and participation are involved in the 17 radiological defense districts that have been established, with a RiDEF officer in each district. The radiological defense operational set, which is used for both public shelter and outlying monitoring stations, includes several detection instruments. One Geiger counter with earphones to detect low-level contamination of food, water and personnel. Its range is 0 to 50 mR/hr. One ionization chamber survey meter for detection of high-range radiation, at intensities from 500R/hr. To measure the total dosage received by monitoring personnel, the set includes three-pocket chambers (direct reading dosimeters), which have a range of 0 to 200 R. There is also a charger to reset the dosimeter after each use.

(NSA:19:15810)

247) Clifford, C.E.

RADIATION SHIELDING STUDIES AT THE DEFENSE RESEARCH BOARD.

5432

Trans. Amer. Nucl. Soc., 10: 722 (Nov. 1967)

Abstract: From 15th Conference on Remote Systems Technology and Atom Fair, Chicago, III., Nov. 8-9, 1967.
See CONF-671102.

248) Commoner, Barry.

CIVIL DEFENSE, THE CITIZEN'S CHOICE.

Nucl. Inform., 6: No.7, 1-17 (June-July 1964).

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Abstract: Civil defense is discussed in its role as the defensive aspect of nuclear war. Basic facts concerned with nuclear weapon types and stockpile magnitude, chemical and biological weapons, delivery vehicles, types of attack, and immediate consequences of attack are presented. The ability of society to recover from a nuclear war is considered in three parts: population, industry, and agriculture.

- 249) Compere, Edward L.

MASS CASUALTIES: SURVIVAL IN THE EVENT OF AN ALL-OUT THERMONUCLEAR ATTACK.

J. Intern. Coll. Surgeons, 38: 93-5 (July 1962)

Abstract: The predicted results of a 5-megaton explosion in an urban area are described, as well as means of preventing and treating casualties in a thermonuclear war.

(NSA:17:36058)

- 250) Corsbie, Robert L.

THE PROBLEM OF NUCLEAR SHELTERS.

Arch. Environ. Health, 8: 613-21 (April 1964)

Abstract: The rationale for the development of civilian defense in the U.S. is reviewed. The effects of nuclear weapons are summarized for various blast parameters, distances, and areas. Biological effects of radiation and the protection afforded to the population by shelters in the event of radiological warfare are discussed. Protective criteria for shelters are outlined. The need for advance preparations is stressed.

- 251) Dale, T.

MILITARY MEDICAL SERVICES AND THE PHYSICIANS.

Tidsskr. Norske Lægeforen., 83: 923-6 (June 1, 1963)

Abstract: The aims of the Military Medical Services and their organization for war are outlined. The role of the Medical Officer against the background of the basic principles of the services, by having facilities for taking care of thousands of casualties

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at short notice and within a very short time, have developed methods and procedures which are useful in the planning of the treatment of mass casualties among civilian populations resulting from a nuclear attack.

252) Dodge, Arnold H.

THE 962 CIVIL DEFENSE EMERGENCY HOSPITAL PROGRAM.

N.Y. State J. Med., 63: 3144-6 (Vol. 1, 1963)

Abstract: The federally sponsored CDEH (Civil Defense Emergency Hospital) plan is discussed and attempts made to determine whether this plan is properly directed, whether the greatest emergency care capacity yield per dollar spent is being accomplished, and whether there are alternate or concurrent measures which should be initiated better to achieve the objective.

253) Donaldson, L.W.

PINPOINTING THE PHYSICIAN'S RESPONSIBILITY IN CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL DEFENSE.

J. Med. 63; 2129-31 (July 15, 1963)

Abstract: The civil defense implications of CBR warfare are discussed. It is concluded that CW, BW, and RW (referring here to ionizing radiations resulting from fallout rather than that associated with the initial blast) have certain general characteristics in common. They can produce large numbers of casualties over fairly extensive areas; they cause death or disability by alteration or interference with normal physiologic processes; in most cases, the agents can be present at sufficient levels to cause their effects without being detectable by the senses; and in the case of CW and BW agents brief exposure to minimal quantities may be sufficient to result in death or disability. In the event of attack with any one of these weapons, it is almost inevitable that civilian populations as well as military personnel would be affected. On the basis of these general characteristics alone, to which are added the specific effects of chemical toxins, pathogenic organisms, and ionizing radiation, the total medical and public health problems which could result from individual or combined use of these three weapons systems appears almost overwhelming. Responsibilities of the physician in the pre-attack period to improve defenses against CW, BW, and RW are considered.

(NSA:18:10326)

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- 254) Echeverria, Eduardo

PREVENTIVE ASPECTS IN NUCLEAR ATTACK.

Rev.Sanidad Mil.(Mex.), 17: 154-65(Mar-apr.1963)

Abstract: A description of protective measures to be taken in a nuclear attack is given and the terminology defined. The immediate effects of a 5-megaton explosion are described, as well as the distribution of the radiation which follows.

- 255) Egorov, P.T. et al.

GRIZHDANSKAYA OBORONA. (Civilian Defense)

Moscow, Vysshaya Shkola, 1962.

Abstract: Civilian defense against aerial nuclear attack is discussed. Reconnaissance of contaminated areas, safety and emergency methods, degassification, decontamination, and disinfection as well as medical aid are discussed.

(NSA:17:321)

- 256) Eicherly, Elizabeth E.

CIVIL DEFENSE IN A NUCLEAR AGE - LIVING AND NURSING IN A FALLOUT SHELTER.

Amer.J.Nursing, 65:123-5 (Nov.1965)

Abstract: Some medical problems that may arise during confinement in a fallout shelter are enumerated and means whereby nursing care can overcome them are mentioned. Some individuals will be unable to function intelligently during the emergency. With-in an hour or so after entering a shelter, the body temperature of many individuals will rise several degrees due to excitement the elevation of room temperature, and the physical activity of a number of people working in a confined area. Their temperatures usually will return to normal within 12 to 24 hours. During the first day or two of shelter occupancy, many persons may develop headaches. Inadequate ventilation also may cause some persons to experience lightheadedness or actual dizziness. Some of the occupants may develop diarrhea and nausea, due to freight, excitement, anxiety, and the hyperactivity of the individual prior to shelter occupancy.

Some problems which arose during the several simulated shelter stays, in which small groups of persons lived for several days in an area providing 10 ft² of space per person, are presented. Some of the common medical emergencies which will arise during the shelter stay are described.

(NSA:21:6527)

257) Eitinger, L.

PATHOLOGIC PSYCHOLOGIC REACTIONS TO DISASTERS AND THEIR TREATMENT.

Tidsskr. Norske Laegeforen., 83-964-6 (June 1, 1963)

Abstract: A survey concerning the most important psychologic reactions that may be expected after disasters is given and their first-aid treatment described briefly. Emphasis is laid on the prevention of panic situations.

258) Eyring, Henry.

CIVIL DEFENSE: A SYMPOSIUM PRESENTED AT THE BERKELEY MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE DEC. 1965.

Washington, American Association for the Advancement of Science, 1966.

(American Association for the Advancement of Science Publication No.82) (3K)

Abstract: The important consensus produced at this symposium is that the public should make the decision on civil defense and should be better informed in order to make a wise decision. The papers included are The basic case for civil defense, civil defense as insurance and as military strategy, the effect of civil defense on strategic planning the possible effectiveness of civil defense, medical aspects of civil defense, the agricultural problems in civil defense, feasibility of biological recovery from nuclear attack and panel discussions.

259) Fairlamb, James R.

NUCLEAR SURVIVAL MANUAL. SOSDEC-THE CONCRETE CURTAIN.

Butler, N.J. Drexel Winslow & Farrington, 1963.

Abstract: When advantages and disadvantages of fallout shelter access are weighed, it becomes apparent that protection in the event of nuclear attack is necessary for the maintenance of a free civilization. The purpose of this manual is to make available in one complete reference, facts upon which the decision to build, or not to build, a fallout shelter may be based. Written for the layman, it is intended as a guide for shelter construction. To allay fear of the unknown attention is given to what can be expected in a nuclear attack: immediate effects of the explosion; type of nuclear explosions; thermal radiation and resultant injuries; blast behaviour; attack possibilities; and survival range. Presentation of basic principles of radiation and nuclear physics contributes to the understanding of radioactivity effects, detection, and dosimetry. Essentials for shelter survival are discussed in detail, and the Bomb Shelter in Depth (BOSDEC) is applied to shelter construction specifications and procedure. A glossary defines nuclear science terms pertaining to warfare.

260) Fenner, H.W.

PROVIDING FOR WATER UTILITY OPERATION AFTER NUCLEAR ATTACK.

J. Am. Water Works Assoc., 54: 621-30 (June 1962)

Abstract: Because of the resumption of nuclear bomb testing and increasing cold war tensions, it is important that water utilities take immediate steps to develop emergency plans to cope with a nuclear disaster. A number of water utilities have already done so, but too many have not faced up to the problem of emergency planning. Careful attention should be given in the emergency planning steps outlined in the following paper. Especially worthy of emphasis is the need for personnel training, particularly in the use of emergency radiation monitoring equipment and interpretation of the readings. Such instruction is highly important for utilities using surface water supplies. It should be pointed out, that emergency monitoring equipment is considerably less expensive and requires much less skill to operate than does low-level peacetime equipment for radioactivity measurement. Because of rapid technological developments, there is a continuing need for more information to assist utilities in emergency planning. The AWWA Board of Directors, during its January 1962 meeting, accordingly approved the formation of the Committee on Civil Defense Planning and Operations. The time for water utilities to plan for emergencies is now, however. Plans should be developed on the basis of existing facts and modified as new information is released.

..(NSA:16:22468)

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261) Flattery, Mark.

EMERGENCY FIELD SANITATION.

Environmental Sanitation, Province of Manitoba, Winnipeg.
Can J. Public Health, 74: 431-6 (Sept. 1963)

Abstract: Sanitation problems that would arise following a thermo-nuclear attack are envisioned and ways to meet them are outlined. It is concluded that the problems of field sanitation are not too difficult to solve provided they are dealt with promptly and are properly planned.

262) Forbes, Robert S.

FOLDABLE FALLOUT SHELTER.

Feb. 1962.

Abstract: An easily erectible and collapsible tent-like structure is designed which includes a floor and may be adapted for use either outside or inside. The erecting mechanism may be mechanical or hydraulic and is independent of external power sources.

263) Fowler, J.M.

EFFECTS OF NUCLEAR EXPLOSIONS.

1963.

Abstract: The causes, consequences, and steps that lead to nuclear reactions and explosions are discussed. The construction, cost, efficiency, stockpiles, blast, heat, and fallout are considered. A hypothetical case of an actual attack on a target is also discussed.

264) Freni, S.

HYGIENE AND SURVIVAL OF THE CIVILIAN POPULATION IN MODERN WARFARE.

Giorn.Med.Mil., 112:241-58 (May-June 1962) (In Italian)

Abstract: In Italy, in spite of warnings from authoritative sources, the response of civil population to fallout shelters has not resulted in the proper participation. The immediate heat, blast,

and radiation effects are estimated for a one-Mt nuclear device: a crater with a dia of 198.2 m and depth of 42.6 m, with houses collapsing within a radius of 4.82 km, fires developing within a radius of 14.5 km, traumatic lesions due to flying debris occurring in an area of 75.5 km², acute irradiation exposure (700 rem) extending to a radius of 2.4 km, and heavy fallout covering an area of 518 km². Any fallout shelter presumably must give ample security for three to fourteen days and must take into consideration penetration of radioactive dust, emergency illumination, refuse disposal, and so forth. Unlike the situation after the last war, it will be impossible to provide a sufficient water supply due to the fallout contamination of most water sources. After the population leaves the destroyed cities and concentrates in zones free of tropospheric fallout, characteristic hygienic problems will appear. Postwar problems will include: radionuclide saturation of the available living space, incomplete protection from weather, insufficient clothing, damaged heating systems, insufficient general hygienic services, inadequate personal hygiene due to mass inertia and indifference, and easy diffusion of disease-vector parasites with poor sewage disposal. This will be aggravated by the dissimilarity of the cultural and educational background of survivors and the necessary dissimilar medical assistance accentuated by problems of collective living. Feeding the survivors will depend upon the available means of decontamination and use of noncontaminated food to assure a daily diet of at least 1800 to 2000 cal. Children, adolescents, pregnant and nursing women, and persons with special diets will pose additional problems. The various proposed decontamination procedures which principally are those of traditional biological and chemical purification methods cannot always be considered completely safe in their practical application. Problems relating to disease are also discussed. The main diseases expected to be encountered are: respiratory infections, salmonellosis, shigellosis, and forms of mycotic and parasitic curaneous diseases. It is possible that the classical plagues may reappear in Italy. Defensive measures will require isolation of affected persons, rapid diagnosis of the disease, with rapid and simple use of identification techniques, such as fluorescent antibody and infrared spectrophotometry tests. Hospitals will need the availability of large supplies of various equipment, medical apparatus, vaccines, serums, antibiotics, and chemotherapeutic agents. There is a necessity for auxiliary health personnel, of whom there is still a great scarcity in Italy. The level of hygienic-medical education attained by the population will be a decisive factor, and only through mass education and modern disease preventive measures can this problem be resolved.

(NSA:19:13123)

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265) From, Paul

THE MANAGEMENT OF RADIATION CASUALTIES.

(J. Iowa State Med.Soc. 52; 406-9 July 1962)).

Abstract: The creation and stockpiling of nuclear weapons introduce the possibility that, sooner or later, accidentally, some of them may go off, and physicians must assist in making realistic preparation for such occurrences. An estimate of the number of casualties which might occur is impossible because of the number of variable factors involved: type of burst, type of construction of the city, season of the year, density of population, time of day the detonation occurs, and magnitude of the detonation. A thermonuclear device can cause casualties by three principle means; blast, thermal burns, and radioactivity, which would vary in importance according to the three methods of detonation (in the air, on the ground, or in water). The following are the types of casualties resulting from the bombing of Hiroshima and Nagasaki: blast effects (direct and indirect); burns (flame burns and flash burns); effects of radiation energy on the eye (including development of cataracts); keloid changes; pigmentation and depigmentation due to uv rays; radiation injury, primarily from the effects of γ rays and neutrons; delayed radiation effects from β rays and α particles emitted by the fission products immediately after the explosion; and residual radiation effects. The effects of radiation are described in detail. In the event of a blast, all permanent facilities in the area will disappear, and all trained personnel and supplies will be destroyed. The area will be inaccessible for 14 days or more and anyone surviving and not protected from radiation will develop radiation sickness. Therefore, protection in areas where fallout pattern could extend for hundreds of miles should be emphasized. Passive protection implies remaining in the contaminated area but taking all possible shelter, particularly from γ rays emitted by the fission products in the fallout, considering that the rays can travel only in a straight line and can be absorbed or stopped only by massive shieldings. Active protection, implying evacuation to a safe area, is not feasible. Decontamination after the fallout has settled is important, but the procedures are extremely hazardous since they involve exposure of the operating personnel to fairly high levels of radiation. After thermonuclear attack, everyone must seek shelter immediately and remain there for at least 14 days. Hospitals should stock food and water to carry them through the critical period, and plans must be made for decontaminating anyone entering the hospital area. If radiation-syndrome casualties are found, it should be

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ascertained if a lethal dose of radiation has been experienced, and attention given only to those likely to survive.

(NSA:19:18126)

266) Gennarelli, L.

MEANS OF PROTECTION FROM FALLOUT OF NUCLEAR AND THERMONUCLEAR EXPLOSIONS.

Minerva Med., 55:355-6(Feb.10, 1964)

(In Italian)

Abstract: The effects of explosions of thermonuclear weapons are discussed with reference to protective measures for human populations. The discussion is based on postulated destruction, immediate radiation, and fallout from detonation of a 20-Mt weapon in a populated area. For such a weapon the destructive and thermal effects would extend for 40 km, and radioactivity from fallout would be appreciable up to 300 km. Problems associated with protection from early and late fallout are considered, along with meteorologic factors that would affect the intensity of fallout in various situations. Requirements for protective shelters against fallout are outlined. It is estimated that seven hr after a detonation the ambient radioactivity would fall $1/10$ the initial level and by 49 hr to $1/100$ that present initially. The emission of ^{14}C would be one of the most serious consequences in humans in the postattack phase; ^{137}Cs , ^{90}Sr , and ^{131}I would also be highly hazardous although their half lives are much shorter than that of ^{14}C . Various methods whereby the body burden of these radionuclides could be reduced in the postattack phase, such as by giving Lugol's solution (containing ^{127}I -iodide) to infants to lower ^{131}I uptake by the thyroid, are presented.

(NSA: 20:5416)

267) George, V.H. et al.

CIVIL DEFENSE TRAINING EQUIPMENT.

U.S. Patent 3, 035, 772. May 22, 1962.

Abstract: A method is given for simulating nuclear weapon fallout for training of Civil Defense personnel. The method comprises laying one or more cables on or below the ground and passing a-c

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electric current through the cables to create a magnetic field. Magnetic field patterns of almost any shape or size may be established with the appropriate cable layout, and the field may be made to decrease with time.

(NS :16:19213)

268) Peck, George W.

FALLOUT: WHAT A HOSPITAL CAN DO ABOUT IT.

Can. Hosp., 39: 46-93 (June 1962)

Abstract: Protection of hospital patients and personnel from fallout resulting from thermonuclear war is discussed, and a description is given of plans that are being developed to examine and assess the requirements for protected units in hospitals, both new and existing. Pilot studies of Canadian hospitals indicate that, within the scope of existing building, much can be done to adjust the hospital program to cope with fallout hazards. Also, provision can be made for shielding the essential functions of the hospital, and for continuing the vital services of a hospital during a period of gross radiation hazard. Procedures are developed to enable local authorities to evaluate the fallout shelter potential of existing hospital structure, and guidance is also provided for the improvement of both radiation shielding and general habitability. Tabulated data are provided showing the space requirements for various categories of hospital shelter occupants and for operating facilities. Floor plans, showing maximum utilization of space yet providing a high degree of protection to hospital occupants, are illustrated. Hospital facilities provided for in the emergency plans include ventilation, power, and illumination supply, food preparations, sanitation (sewage, garbage, and waste disposal), and storage of drugs and other medical supplies.

(NSA:17:18412)

269) Gonzalo, G.P.

ORGANIZATION OF PUBLIC HEALTH DURING DISASTERS.

Med.Trop.(Madrid) 39:59-77 (Sept.Oct. 1963)

Abstract: Effects of thermonuclear weapons explosions are described, and civil preparedness against such attacks and other disasters is discussed.

(NSA:19:28590)

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- 270) Gruber, Charles W. and Schumann, Charles E.

CINCINNATI'S RADIOACTIVE FALLOUT MONITORING PROGRAM.

J. Air Pollution Control Assoc., 13: 195-7 (May 1963)

Abstract: Two aspects of Cincinnati's fallout monitoring program are discussed: monitoring in the event of a nuclear attack and routine daily monitoring of fallout. The history of the Hamilton County civil defense and Cincinnati air pollution organization is described. The network of monitoring stations and the training program are discussed. A continuous air monitor for beta activity is described. Fallout data collected as a part of the National Air Sampling Network are given.

(NSA:17:25493)

- 271) Greer, H. et al.

RADIATION FALLOUT METER.

U.S. Patent 3, 191,033. June 22, 1965.

Abstract: A radiation detector that can be operated by the average person and that has a long shelf life is intended to measure radioactive fallout caused by nuclear accidents or nuclear weapons.

(NSA:19:39051)

- 272) Hacon, T.S.

ECHELONS OF MEDICAL CARE.

Can. Med. Assoc.J., 87: (Dec.1, 1962).

Abstract: Organization of the Canadian Emergency Health Services and its mobilization of medical facilities during a nuclear attack are outlined. It is estimated that a nuclear attack on Canada might reduce its medical and hospital care resources to about one-half by losses occurring in target cities. The remainder would be faced with an immense task of caring for casualties and in the absence of planning, it would die because of inadequate medical care. Many more would remain disabled, but with planning, the mortality rate can be reduced.

(NSA:17:12068)

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273) Hardman, A.C.

CIVIL DEFENSE HEALTH PROGRAMS IN CANADA.

N.Y. State J. Med., 63: 1715-17 (June 1, 1963)

Abstract: Problems of civil defense planning in Canada are discussed in terms of a hypothetical attack in North America. The estimate of disaster was designed to indicate those areas in which effective care, was assigned to two agencies. The responsibility for planning in the prevention of radiation injury was divided between two other federal agencies. The Department of National Defense has established a nuclear detonation and radiation fallout warning system which will identify the point of detonation, size and height of burst; and predict fallout patterns for warning the population at risk. In addition, 2,000 fallout reporting stations are manned on a 24-hr basis and are capable of reporting to regional authorities the actual intensity of the radiation present at that point. The warning of the population will take place through the siren system and the Emergency Broadcasting Network of our Canadian Broadcasting Corporation. Plans for the production of shelter space have been assigned to the Emergency Measures Organization, with major reliance on individual action by families to provide shelter. However, surveys have been carried out of all suitable shelter space in existing government buildings, and the costs of converting such space have been determined. Measures to be executed at various postattack phases are outlined. Emphasis is placed on disaster planning for hospitals and municipal departments of health and the integration of such plans into a municipal disaster plan. An information and education program is directed to the general public in conjunction with other agencies, specifically in providing information on the types of health hazards and measures that could be taken to prevent spread of disease. The federal government has authority to stockpile some \$18 million of supplies which will provide for 200,000 casualties for 21 days. A large portion of the stockpile has been procured and packaged for long-term storage and distributed to regional depots across the country. Some 200 200-bed hospitals have been procured as the first phase of a 500-hospital project. A survey is being conducted to available stocks of medical supplies and equipment and the production capability of industries, with a goal to make the municipality self-sufficient for seven days, the provinces self-sufficient for 30 days and the country as a whole for six months.

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- 274) Harry, H.H. and Robert, D.J.

GENERAL EFFECTS OF NUCLEAR WEAPONS WITH NOTES ON DEFENSE PROBLEMS.

Atomic Medicine. Fourth Edition. 1964.

Abstract: The general effects of nuclear weapons are reviewed with emphasis on medical aspects. The effects of blast, trauma, thermal radiation, ionizing radiations, and fallout are considered. Data on the effects of 20 KT nuclear bombs on the populations of Hiroshima and Nagasaki are reviewed and an attempt is made to extrapolate these effects to those of kiloton bombs. Data from nuclear weapons tests are also reviewed. Data are tabulated on the ranges in miles of certain bomb effects of medical interest for KT, 10KT, 100KT and 1 MT bombs. It is postulated that the ability of the people of the United States to survive a nuclear attack will depend largely on advance preparations. The importance is stressed of adequate warning and shelter systems.

(NSA:19:15207)

- 275) Henry, A.B.

A MEDICAL PROGRAM FOR NUCLEAR DEFENSE: A WORKABLE PLAN.

J.Med.Soc. New Jersey, 59: 4-7 (Jan.1962)

Abstract: A plan covering medical aspects of civil defense is proposed which includes four main provisions: (1) creation of 12 autonomous regional target areas, (2) widespread education in first aid for nuclear weapons casualties, (3) collection and triage of casualties, and (4) air evacuation of certain classes of casualties. It is proposed that the Director of the Office of Civil and Defense Mobilization could divide the country into 12 autonomous regional target areas corresponding to the U.S. Civil Service Regions. Each target area would have a director and staff to control all facets of civil defense in its zone, and be responsible to the National Director. This would keep cities and states from engaging in inadequate and impractical defense activities because a nuclear attack zeroed on New York City would involve at least five states. A compulsory national education program in the treatment of radiation, blast, and thermal injuries should be initiated, it is suggested. Another essential step is to plan predesignated collection points for casualties along the main roads

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radiation from ground zero of a bombed city or area. Here they will be sorted into five classes by teams consisting of a doctor and lay assistants. Triage (the sorting of casualties into these five classes) will save time, effort, and increase the efficiency of the medical plan. The seriously injured who require major surgery and definitive treatment should be evacuated to intact hospitals.

(NSA:19:18212)

276) Hinshaw, Raymond J.

PROTECTION AGAINST THERMAL BURNS FROM NUCLEAR WEAPONS.

J. Oklahoma State Med. Assoc. 56:212-15 (May 1963)

Abstract: The nature of thermal injury from nuclear detonations is described, and some experimental data on pigs and human volunteers are used to form the basis for recommendations for protection of human populations who may be exposed in a thermonuclear attack.

277) - Hisle, Leon W.

COMMUNITY PREPARES FOR DISASTERS.

Hosp. Management, 94: 47-9 (Nov. 1962)

Abstract: Hospital disaster plans and a list of items for emergency use in civil defense and other disasters are outlined.

278) Hurst, W.D.

NUCLEAR DISASTERS AND EMERGENCY WATER SUPPLY.

Can J. Public Health, 54: 417-25 (Sept. 1963)

Abstract: The following aspects of nuclear disaster problems are considered: effects of nuclear weapons; assessment of the vulnerability of a water work system; protective measures to be taken prior to attack against fallout, blast, and thermal effects; conditions to be expected following an attack; and measures to be taken to restore system operation, or, alternatively, if the postattack examination shows that the normal supply system is destroyed beyond repair, the provision of alternate facilities.

- 279) Inderwiesen, F.H.

RECEIVERS FOR THE NATIONAL EMERGENCY ALARM REPEATER SYSTEM.

Elec. Eng. (Trans. Am. Inst. Elec. Engrs.), 80:670-5 (Sept. 1961)

Abstract: The NEAR system, a recently developed means for rapidly alerting the population in case of emergency, operates by an alarm signal transmitted through the power lines. Operational requirements of the system and technical features of the receiver are discussed.

(NSA:17:3242)

- 280) John, Newman.

INTERNAL CONTAMINATION OF BUILDINGS BY FALLOUT.

Oak Ridge National Lab., Tenn. 931-9 Sept. 1967.

Abstract: Quantitative assessment of the possible loss of radiation protection in above ground fallout shelters due to window breakage and internal contamination requires consideration of the mechanism of the settling of fallout, the radiation shielding of building distances of blast damage, and wind characteristics. These factors are discussed in a manner which would allow assessment for a particular area with fallout shelter in tall buildings. In a particular example of a seven-story building, the internal contamination on each floor is estimated to be 2.5% of that on the roof. This contamination, if spread uniformly over the floor, reduces the protection factor on the fifth floor from 28 to 18 and in the unexposed, uncontaminated basement from 420 to 200.

(NSA:21:39161)

- 281) John, W.W.

NON-MILITARY CBR DEFENSE.

Ariz. Med. 19:56-60 (Mar. 1962)

Abstract: The effects of chemical-biological-radiological (CBR) warfare on exposed populations and possible defensive measures are discussed. Estimates are made of total casualties and the percentage of casualty types (blast, burns, radiation) from thermonuclear weapons of various size. Radiation doses permissible to civil

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defense personnel during life-saving operations are discussed; as an upper limit, it is suggested that the cumulative dose over a 7 day period may be 33 r for routine operations, 66 r for operations with a calculated risk, and 96 r for command decision operations. The latter operations would thus entail a 6-week mortality rate of 0.5% or less. Construction of fallout-protected hospitals is discussed, as well as the high demand for antibiotics for radiation injured patients following thermonuclear warfare, which might overtax the national supply.

(NSA:16:32627)

282) Johnson, R.E.

WATER AND OSMOTIC ECONOMY ON SURVIVAL RATIONS.

J.Am.Dietet.Assoc. 45:124-9 (Aug. 1964).

Abstract: The results of simulated fallout shelter tests during which three groups of volunteers consumed the survival rations designed to be used in the shelters during a thermonuclear attack, are reported. Emphasis is given to the effect of these rations on water balance.

(NSA:19:36725)

283) Johnston, Herbert Charles.

MANUFACTURE OF MOTOR VEHICLES FOR ADDITIONAL PROTECTION FROM RADIATION HAZARDS.

(U.S. Patent 3, 212,809). Oct. 19, 1965.

Abstract: A self-propelled land vehicle, such as a station wagon, is provided with special features that make it applicable for use by civilian defense personnel during early radiation fallout from a nuclear attack. The body portion of the vehicle includes a sheath of lead of not less than 1/16 in. thickness, and the windows and windshield are fabricated of lead glass. The outside of the body is painted with a highly reflective lead paint or one coat of a lead paint and one coat of a highly reflective paint.

(NSA:20:5679)

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284) Juilly, Marcell E. et al.

FOODS FOR FALLOUT SHELTERS. II FOOD STORAGE, PACKAGING, AND SURVEILLANCE.

Food Technol., 16: No. 8, 25-7 (Aug. 1962)

Abstract: Stability of various food products, stockpiled for long periods in fallout shelters, is considered in relation to packaging, periodic sampling, and replacement. Among the most stable foods are highly refined foods, such as salt and sugar. With adequate package protection, they remain unchanged indefinitely. Unprocessed cereals and seed foods (beans and peas) retain acceptable food quality for 20-50 years if they are protected from insect infestation and moisture. Milled and ground cereals may also have a long shelf life, although they are more subject to oxidative changes than unprocessed cereals. Dehydrated foods, as a class, are stable, and with proper control of moisture content and with formulation and packaging to resist deterioration, a shelf life of 5-10 yr should be attainable. The packaging used for shelter foods is unusually important. Tin cans satisfy most requirements, but may not have adequate durability in a damp shelter. If shelter stockpiles are to be held over an indeterminate period, stored food must be inspected and replaced before it becomes unacceptable. Regular inspection will be necessary. Data on the deterioration rates of foods do not apply specifically to shelter circumstances.

(NSA:17:8442)

285) Kadrovach, D.G.

AREA-WIDE DISASTER PLANNING.

Hospitals, 36: 45-8 (Nov.16, 1962)

Abstract: The role of hospitals in ensuring national survival in the event of thermonuclear war is surveyed. The hospital has three primary responsibilities in disaster planning: to be prepared for local disaster, to be prepared to make a substantial contribution in disaster involving thermonuclear weapons, to be prepared to protect its personnel from the hazards of fallout. Hospital preparations for mass casualties resulting from thermonuclear warfare require area-wide planning. As a model situation, this concept of area-wide planning is applied to San Antonio. Maximum utilization

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tion of hospital services in surrounding zones is discussed. It is suggested that a hospital complex should surround the target area.

(NSA:18:5557)

286) Kaplan, Arthur L.

BASEMENT RADIATION FROM AN INFINITE PLANE GAMMA SOURCE.

Trans. Amer. Nucl. Soc., 8: 654-5 (Nov. 1965).

(NSA:20:3272)

287) Karcher, R.H. and Wilson, J.H.

INITIAL RADIATION SHIELD REQUIREMENTS FOR HARDENED STRUCTURES.

Trans. Amer. Nucl. Soc., 8: 658-9 (Nov. 1965).

(NSA:20:3276)

288) Kenneth, W.Y. and Robert, C.S.

BUSINESS CAN SAVE 70,000,000 LIVES.

Harvard Business Rev., 39: No.6, 6-8; 12-13;16; 20; 24-25; 190; 192; (Nov. Dec. 1961)

Abstract: Discussion is given on the thermonuclear threat, the effects of thermonuclear weapons, and the types protection required against these effects; requirements for a minimal type of fall-out shelter, in terms of both physical structure and ancillary equipment; ways in which various types of buildings in everyday commercial and industrial use fulfill the requirements for shelters, and the methods of modifying buildings to incorporate such provisions; and the elements of sound planning for the use of shelters. Actual examples and building plans are used to show what can and should be done. It is felt that a sound shelter program carried out by industry and local government could save up to 70 million lives in a heavy thermonuclear attack (depending on the areas bombed and weather conditions)

(NSA:16:11988)

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289) Kerr, James W.

CIVIL DEFENSE AND THE VETERINARIAN.

J. Amer. Vet. Med. Ass., 147: 1522-6 (Dec. 15, 1965)

Abstract: Recent developments in the fallout shelter system, as a major component of civil defense, are reviewed, and the role of the veterinarian in civil defense is outlined. Duties of the veterinarian in event of a thermonuclear attack would center around public health activities, including zoonosis and food sanitation. This would probably take priority over the individual direct medical attention to animals. If the situation were critical enough, the treatment of human casualties would take precedence over everything. The treatment of human casualties by non-physicians is considered. Veterinarians might be called upon to perform so-called physician functions. However, it is emphasized that their involvement with human casualties would in most instances be limited and often under direct guidance of a physician. In many cases, their services would be more applicable in other areas more directly related to their professional training. If the emergency situation demands that veterinarians become involved with human medical problems, it would most likely be for a short time only, after which their services in the rebuilding of the community would be an indispensable contribution.

(NSA:20:33579)

290) Kimel, W.R. and Faw, R.E.

SCATTERING OF FALLOUT RADIATION FROM CEILINGS OF PROTECTIVE STRUCTURES.

Kansas State Univ., Eng. Exp. Sta., Bull., No.72, 1-168 (July 1966).

Abstract: A study of the ceiling shine problem was made. Ceiling shine is defined to be that contribution to the radiation dose rate in a protective structure resulting from fallout radiation entering the structure through apertures in vertical walls and scattering downward from the ceiling. A systematic analytical analysis of this problem, verified experimentally resulted in a set of design curves. These curves yield the ceiling shine reduction factor in any concrete structure as a function of building dimensions, size and location of apertures, and detector location.

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291) Knapp, H.A.

MAGNITUDE AND DISTRIBUTION OF WEAPON EFFECTS FOR THE DESIGN OF SHELTERS FOR PROTECTION AGAINST FALLOUT. (Research Paper P-194).

AD-624370

Abstract: Estimates were made of the numbers and yields of weapons which would be detonated in the United States, and to indicate where it is likely that they would be detonated. Data are presented to enable, for any given level of attack directed against populations, a rough allocation of weapons among each of the 213 principal urbanized areas in the United States. The model and data indicate that the Washington (D.C.-Va.-Md.) urbanized area, with 1.8 million persons and covering 340 square miles, would be allocated 31-Mt weapons in an attack against the population of the United States consisting of 100 1-Mt weapons airburst at optimum altitude. The model and data indicate this area would receive 12 1-Mt weapon for an attack against the United States consisting of 1000 1-Mt surfacebursts. In each case the entire District of Columbia, consisting of 62 square miles at an average density of 12,400 persons/square mile is subjected to blast levels of at least 5 psi. For an attack against the U.S. population with 300 1-Mt airbursts, or 1000 1-Mt surfacebursts, the model indicates that the entire Washington urbanized area, including Rockville, Maryland, could anticipate blast levels of at least 5 psi.

(NSA:20:16620)

292) Kraybill, H.F.

CIVIL DEFENSE IN THE FOOD INDUSTRY. 3. RADIOLOGICAL HAZARDS IN PROCESSED FOODS RESULTING FROM NUCLEAR WARFARE.

Food Technol., 16: No. 2, 13-6 (Feb. 1962)

Abstract: The level of radioactive contamination in foods contributed by natural sources, fallout radionuclides from nuclear-weapons testing, and the calculated high levels from a nuclear attack are discussed to show the relative influence of these factors on the safety of the food supply. Packaged or processed foods stored in a shelter might withstand damage from the blast effect of a nuclear detonation. However, processed food subjected to blast and thermal damage might be slightly radioactive from neutron activation,

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as demonstrated in the 20-KT shot in the 1955 Nevada tests. Allowing for radioactive decay, such foods would be safe to consume in a few weeks. Unharvested food crops, heavily contaminated with fallout from nuclear detonations in a war, would require careful decontamination under competent supervision. These foods also provide the starting materials for processed and canned foods, so remedial measures (washing, milling, or reining, and special processing) would be required. Processed foods in cans or glass would be preferred following nuclear attack. The safety of consumption and the wholesomeness of radionuclide-contaminated foods is discussed and it is concluded that they could be used under some conditions during the dire emergency of an immediate post-war period.

(NSA:17:6340)

293) Krijnen, J.J.

MEDICAL ASPECTS OF ATOMIC WARFARE.

Vierde Macht, 15: 59-64 (Apr. 1966)

Abstract: A nuclear weapon explosion produces three sorts of energy: atmospheric pressure, radiation, and radio-activity. The pressure causes 40% of the injury, heat radiation 60%, and 15% comes from radioactivity. From these percentages, it is evident that a number of persons have more than one type of injury.

294) Langhans, A. et al.

SCHUTZ VOR MASSENVERNICHTUNGSMITTELN. SCHUTZ VOR KERNWAFFEN,
CHEMISCHEN KAMPFSTOFFEN UND BIOLOGISCHEN KAMPFMITTELN.

1963.

(In German)

Abstract: A handbook for the layman outlines precautions to be taken against nuclear weapons, chemical warfare agents, and biological warfare agents. Decontamination measures to be followed in case of contamination or contact with these agents are included.

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295) Langhans, Anita.

MEANS AND METHODS OF PROTECTION AGAINST MASS DESTRUCTION.
PART I. NUCLEAR WAR EFFECT AND PROTECTION POSSIBILITIES.

Berlin, Deutscher Militaerverlag, 1965

(In German)

Abstract: The essential nuclear physical fundamentals of radiological warfare are reviewed and the types of nuclear weapons are discussed. The capabilities necessary for each type of weapon are briefly indicated. The concept of protection is then discussed. The possibilities for protection against effects of the pressure wave, the light radiation, and the nuclear radiation are discussed in some detail. The possibilities of protection against radioactive chemical warfare agents and non-radioactive chemical warfare agents are also discussed.

(NSA:20:3415)

296) Lapp, R. E.

THE STRATEGY OF OVERKILL.

1963.

Abstract: The origin and stability of deterrence is discussed. The present and projected levels of U.S. strategic deterrent power are also examined.

297) Larus, Joel.

NUCLEAR WEAPONS SAFETY AND THE COMMON DEFENSE.

Columbus, Ohio, Ohio State University Press., 1967.

Abstract: The problem of assuring nuclear weapons safety is discussed. One problem that grows increasingly formidable is the possibility of an accident that is either an unintentional, full-scale detonation of an atomic bomb, or alternately, a mishap that does not result in a chain reaction but occasions the release of fissionable material and the subsequent exposure of all in the immediate area to the dangers of radioactivity. Atomic bomb design,

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methods of detonation, and safety are discussed. The case for internationalizing nuclear weapons safeguards is also stated.

(NSA:22:42931)

- 298) Latourette, Howard B.

PHYSICAL ASPECTS OF RADIATION.

J. Iowa State Med. Soc., 52: 399-403 (July 1962)

Abstract: Preliminary to a discussion of protective measures for civilian populations exposed to thermonuclear attack, the nature and effects of radiation are discussed. Protection against fallout is considered, and as a model problem the possible extent of fallout across Iowa from a detonation over the Omaha area, the location of Strategic Air Command headquarters and several missile bases, is projected. It is concluded that under certain circumstances, in certain locations, fallout shelters might be very valuable and make the difference between life and death for the occupants. However, it is noted that present estimates of the value of fallout shelters are predicted on our current understanding of technologic developments, and that within 5 or 10 years they may again need to be completely revised.

- 299) LeDoux, J.C.

ATOMIC DEFENSE ENGINEERING EDUCATION.

Trans. Am. Nuclear Soc., 5: No.1, 263 (June 1962).

- 300) Leiderman Herbert B. and Mendelson, J.H.

THE MEDICAL CONSEQUENCES OF THERMONUCLEAR WAR. IV. SOME PSYCHIATRIC AND SOCIAL ASPECTS OF THE DEFENSE-SHELTER PROGRAM.

New England J. Med., 266: 1149-55 (May 31, 1962)

Abstract: Clinical and research experience are applied to some of the psychological and social aspects of the current defense-shelter program to help physicians to advise their patients and plan for their own and their communities survival. Two major issues are discussed: the psychological impact on the individual and community

in planning for a defense-shelter program; and the psychological and social problems related to shelter utilization in the event of a nuclear holocaust. Data from studies of relatively limited disasters are used to help physicians understand present reactions and perhaps to predict future behavior. In particular, emphasis is made of the differences between acute, relatively short-term stress and chronic, prolonged stress. The evidence presented indicates that for an untrained, unselected urban population, a shelter permitting the group to carry on some of its usual activities would probably maximize adaptive behavior. It would permit some of the same type of differentiation of function that exists in preshelter society. Physical psychological illnesses, which would almost certainly exist in some members of the group, would not appreciably interfere with the survival of the group. Dissolution of the family unit would unquestionably have severe psychological consequences, and community shelters that permit some family members to remain together would be most desirable.

(NSA:17:1674)

301) Leroy, George V.

THE AMERICAN COMMUNITY LOOKS AT CIVIL DEFENSE.

N.Y. State J. Med., 63: 1574-7 (May 15, 1963).

Abstract: Responsibilities of physicians in preparation for a nuclear attack are outlined. It is suggested that adequate civil defense measures may increase the chances of survival to more than 30 to 1. It is pointed out that physicians are uniquely qualified to counteract some of the apathy, indifference, and pessimism based on ignorance that characterizes the reaction of the average citizen to civil defense. Initial medical treatment of Japanese survivors of atomic bombing is discussed. Each aid station cared for approximately 2000 to 4000 casualties during the first two weeks. In each station there were at the most one or two doctors, and only about 200 doctors were active at any one time in caring for casualties at Hiroshima where the toll was from 60,000 to 80,000. Better organization and planning should make it possible for each doctor to treat 5 to 10 times as many people as was the case in Japan. After the detonation of a 1-Mt bomb over a modern urban area of several hundred square miles, the number of casualties able to reach aid stations might be as great as 500,000, and the number of dead outright might be another half million. The areas involved would

include a central area of total destruction of 50 mi² and the area with serious casualties requiring care about 200 mi². An area of this size has a circumference of about 60 mi, and except at the downwind sector the intensity of fallout radiation at any point on the periphery should not exceed 30 r/hr at H plus one hr. To this periphery the casualties would come or be transported, and about this periphery could be located emergency medical facilities. Backing up the mobile emergency stations on the periphery of bombed areas there would be the undamaged hospital system. A fraction of the medical profession must serve in the aid stations, and another portion in the hospitals providing definitive and specialized care for the casualties. Another, smaller, portion would have to be administration, assisting civil defense commanders, assigning emergency units, assigning hospital beds, supervising medical supply, and engaging in public health activities. Organization of physicians within local units is discussed.

302) Letourneau, Charles U. and Harrick, W.D.

NUCLEAR AGE HOSPITAL DESIGN.

Hosp. Management, 90: 39-41 (Aug. 1960)

Abstract: Plans for the construction of a 750-bed hospital that will incorporate two underground levels for fallout protection are described and illustrated. This survival complex is being constructed as a shelter against fallout radiation according to the specifications of the Office of Civil Defense Mobilization. The vital services, being housed in two floors underground, including x ray, laboratories, central service, surgical operating room, recovery room, kitchen and dining room, stores, emergency service, and large areas of storage space equipped with oxygen and suction outlets for use in a disaster. The survival complex is designed to enable hospital personnel and patients plus a limited number of others to maintain themselves for 14 days in complete safety even though the entire outside area be destroyed or saturated with lethal radiation levels. Standby electric generator equipment will be included in the complex and the hospital will have special wells drilled into the survival complex so as to give an adequate supply of water for drinking, washing, cooling and decontamination in the event of destruction of the city water mains. The position of the decontamination unit is such that, in the event of attack, it would not be manned by hospital personnel but by specially trained civil defense experts in decontamination and radiation safety. The emergency area is

entered via the upper level of the survival complex. In the event of atomic attack, leaded radiation-proof doors will slide into position sealing off the survival complex completely. They will be opened to admit patients only upon the instructions of the officer in charge of civil defense protection.

(NSA:19:15733)

303) Letourneau, Charles U.

EVALUATION OF A HOSPITAL DISASTER PLAN.

Hosp. Management, 94: 44-6 (Nov. 1962)

Abstract: Plans prepared for this hospital to be used in civil defense and other emergencies are described.

304) Liddle, William.

CIVIL DEFENSE FOR AUSTRALIAN CITIES.

Med. J. Austral., 2: 502-7 (Sept. 18, 1965)

Abstract: Medical aspects of the response to an attack on Australia with thermonuclear weapons are considered. The putative targets for atomic attack in Australia, the mainland capitals, differ from European and Asiatic cities because they are sturdy; not overcrowded; and surrounded to a depth of many miles by satellite towns, dormitory suburbs, and pockets of habitation. The aggregate population of these surrounding areas is a significant fraction of the metropolitan population, so that an atomic detonation above an Australian city would leave retrievable casualties and un-injured rescuers in unequal numbers. The fact that the injured would be counted in scores of thousands renders this problem unique. The normal medical facilities of the city, the major hospitals, and the large ambulance stations would be destroyed. Citizens of the surrounding safe areas would need to enter the devastated zone and physically remove the injured. The survivors would be suffering from one or more of the following conditions: flash burns; flame burns; injuries from secondary missiles, such as flying glass; and the effects of ionizing radiation. Treatment of these injuries is discussed, and an assessment made of medical supplies and equipment needed to care for large numbers

of casualties. The major burden in the second stage of management of injuries would fall upon the doctors and trained nurses dwelling in the safe areas. Doctors would probably be working in the ratio of one to 1000 patients. Training of medical and paramedical personnel to handle casualties of a thermonuclear attack is proposed and specific recommendations made.

(NSA:20:27218)

305) Lin, S. and Scorrino, Enrico.

CONTRIBUTION OF MEDICAL PRACTICE TO THE PROTECTION OF POPULATIONS FROM IONIZING RADIATION.

Nuovi Ann. Ig. Microbiol. 17:98-132 (Mar-Apr. 1966).

Abstract: An account of physical parameters involved in production of the biological damage by ionizing radiation is given. Total dose absorbed by living tissues, spatial dose distribution, kind of radiations, and their RBE are discussed. The medical practitioner's contribution to defense from radiation somatic and genetic hazards is presented. In this program it is essential to ensure that any unnecessary radiological examination is avoided. Generally, the greatest contribution to the genetically significant dose comes from diagnostic radiology, especially x-ray examinations of pelvic organs which contribute 85 to 95% of genetically significant dose. Modern equipment and proper techniques are necessary to decrease the use of excessive radiation. Since fluoroscopic studies are more dangerous than radiographic examinations, some suggestions are given to diminish the dose to the patients during fluoroscopic examinations. In case of serious nuclear accidents the medical practitioner should be able to give first aid to the victims, recognize symptoms of the acute radiation syndrome, and aid in the containment of radioactive contamination. The participation of practitioners in civil defense is also discussed.

306) Lynch, Francis X.

ADEQUATE SHELTERS AND QUICK REACTION TO WARNING: A KEY TO CIVIL DEFENSE.

Nov. 1963.

Abstract: Case histories collected by investigators in Japan during 1945 illustrate both the effectiveness of shelters and the dangers inherent in apathy of the population, which suffered needless casualties by ignoring air raid warnings. Adequate shelters and immediate response to warnings are essential to survival in nuclear attack.

307) MacMillan, B.G.

BURNS, FRACTURES, AND SOFT TISSUE INJURIES.

N.Y. State J. Med., 64:1994-7 (Aug. 1, 1964).

Abstract: The nature of injuries in casualties of thermonuclear weapon explosions is described, and a procedure for handling such casualties is outlined.

(NSA:19:33872)

308) McConnell, H.J.

CIVIL DEFENSE IN THE FOOD INDUSTRY. PART 6. THE ROLE OF FOOD TECHNOLOGY.

Food Technol. 16:37-9 (March 1962)

Abstract: Where the packaging material is impervious to fallout, war gases, or BW agents and these agents have not been covertly placed in food prior to packaging and the food packages remain intact, no harm will come from food that can be removed from a cleaned portion of a decontaminated container. Food in intact, air-tight buildings will be equally safe. Heat is the best all-around decontaminant for BW; and airing in the open in bright sunlight is one very good method for decontaminating packaged food adulterated by war gases in vapor form.

(NSA:16:33327)

309) Marcus, Stig.

PHYSICIANS IN TOTAL DEFENSE.

Svenska Lakartidn., 59: 1147-51 (Apr. 12, 1962).

(In Swedish)

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Abstract: The role of medical personnel in nuclear war is discussed.

310) Martin, Morgan.

PREPARATION FOR PSYCHOLOGICAL ASPECTS OF NUCLEAR DISASTER.

Can. Med. Assoc. J., 87: 1384-6 (Dec.29, 1962)

Abstract: Psychic reactions of human individuals and populations subjected to catastrophes are outlined, and ways are suggested for dealing with them at various phases of a national emergency. Two myths about disaster have been dispelled by recent research. First, the disaster-struck population is not completely dazed, dependent, and helpless, and second, there is relatively little panic and looting. In a disaster there are 6 special needs of psychological importance: mothering, group formation, special leadership, traffic control, case registry, and communication of adequate information. Disaster studies suggest 3 important psychological first-aid measures: keep people in family groups, encourage talking-out, and provide useful tasks. Such measures are more effective if the helper attitude is adopted. Disaster may be analyzed in 3 phases. It is preceded by warning, ushered in by impact, and followed first by recoil and then by a recovery phase. Studies of the warning phase show the great need for the individual and group to have and to practice a definite plan of action. Lack of definite preparation causes anxiety, which is in addition to that arising from the knowledge of imminent nuclear attack. The best preparation for adequate behavior in nuclear disaster is education and practice.

(NSA:17:21942)

311) Matthews, Earle J.

EMERGENCY HEALTH SUPPLIES: PRESENT STATUS OF PROCUREMENT AND CONTROL.

Can. Med. Assoc. J. 87:1156-60 (Dec.1, 1962).

Abstract: The scope of the Canadian Emergency Health Supplies Program for stockpiling drugs and medical equipment is discussed and its implementation described. In 1962, an \$18,000,000 stockpile was authorized and purchases totaling \$15,500,000 were made with deliveries to exceed \$13,000,000. Over \$6,000,000 worth of supplies was distributed to 8 regional depots across Canada in

safe and strategic locations. Plans were made for release and control of supplies to provincial governments for use at all levels of control, and a Resources Planning Unit was organized. In Canada, undergraduate students in pharmacy receive special civil defense instruction in emergency health supplies service.

(NSA:17:12069)

312) Mennonna, G.

"CIVIL DEFENSE": THE URGE NECESSITY OF A MODERN WAR.

Giorn.Med.Mil., 112: 3-14 (Jan. Feb. 1962).

Abstract: Attention is drawn to the issue of civil defense at the various levels of government and public opinion, and to the danger to survival especially in Europe and North America. The stockpiles of the United States, Russia, England and France are discussed from published figures and estimates. The various zones of destruction by a 1-megaton bomb are outlined, as well as the loss in human life, calculated for the explosion of a 1-megaton bomb over the center of Paris. A few of the problems of medical care, such as the quantity of blood and plasma needed, are touched upon briefly. The Civil Defense program in the United States is discussed. Expansion of the Red Cross for civil protection into this area is recommended.

313) Mitchell, J.M.

THE PROFESSION AND NUCLEAR WARTARE.

Vet. Record., 76: 135 (Jan. 25, 1964).

Abstract: The probable fate of farm animals in a thermonuclear attack is discussed and the value of civil defense training for veterinarians is briefly commented on.

314) Mitrofanov, Nicolas.

METHOD OF INCREASING THE MAXIMUM OPERATING TEMPERATURE OF A RADIATION DETECTION DEVICE.

Sept. 1967.

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Abstract: A method for increasing the maximum operating temperature of a radiation detection device composed of a chamber and a large-area electrode surface is described. The chamber is filled with a gaseous material having some halogen content, an electric current is passed between the two electrodes causing the halogen gas to be absorbed by the large-area electrode, and then the gas is purged from the chamber. Next, the chamber is refilled with a halogen-containing mixture, and the system is gradually heated, then allowed to cool. The heating and cooling step is heated to successively higher temperature. The final temperature is equal to or higher than the desired operating temperature for the device.

(NSA:22:21333)

315) Morani, Alma Dea.

MANAGEMENT OF MASS CASUALTIES: RESUME OF COURSE TAKEN AT THE MEDICAL FIELD SERVICE SCHOOL, BROOKE ARMY MEDICAL CENTER, FT. SAM HOUSTON, TEXAS.

J.Am.Med. Women's Assoc., 17: 134-6 (Feb. 1962).

Abstract: An outline is presented of the U.S. Army Medical Corps 5-day course on management of mass casualties which might result from thermonuclear war or other civil disaster. Basic rules for survival in the event of a disaster are given, as follows: recognition of dangerous conditions and taking of preventive measures; preparation for the event, which includes instructions on what to do when it occurs; heeding warning of alert signals and obeying instructions; making proper use of preparations made; being able to determine when danger is over; proper care for injured and removal of dead; and restoration of livable conditions as soon as safely possible. Subjects of particular interest to the civilian physician were presented. Sorting of casualties is discussed. Civil defense planning at the local, community level is also discussed.

316) Morton, M.R.

IMPROVEMENTS IN AND RELATING TO BOMBSHELTERS.

British Patent 885, 259. Dec.20, 1961.

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Abstract: A bombshelter for individual homes is designed which is relatively cheap to build and provides some protection against the radioactivity and heat of a nuclear bomb explosion. It is made out of reinforced concrete and has two entrances, one leading outside and the other leading to the basement. It has barriers against flooding should a pipe either door be left open or damaged.

(NSA:16:5625)

317) Mushlin, H.H.

DRUGS AND FOOD FOR THE DISASTER SHELTER.

Am.J.Nursing, 64: 116-19 (Oct. 1964)

Abstract: After a description of the wounds and burns to be expected after a thermonuclear attack, the drugs and other shelters are outlined. Practical aspects of use of radioprotectant drugs in exposed survivors are discussed. The most acute needs will probably be those connected with blast and radiation injury. A casualty rate of about 25% is to be expected. The actual amounts of materials to stock will depend on the size of the shelter and the capacity. Civilian defense authorities quote a figure of about 8.5 ft³/ person as necessary in such a shelter, but it is felt that about 10 ft³ is a more adequate arrangement. Probably the greatest number of casualties will occur from the thermal effects of a bomb. Next in order would be wounds from flying debris such as contusions, lacerations, fractures, expected from any blast disaster. Then there would be the effects of radiation fallout. Experimental work on drugs to prevent radiation damage indicate that those showing the greatest promise are the sulfhydryl agents, of which the most protective has been AET (2-aminoethylisothiuronium). This drug used with cysteine is the treatment of choice to protect animals, especially monkeys, from radiation damage. With other drugs their effective therapeutic dose is so close to the toxic dose that they have been discarded; over 2000 chemical compounds have been experimented with, with varying degrees of success. Preparations that depress metabolism have some protective effect. Also, phenone drugs show some degree of radioprotection. Materials that produce tissue anoxia, such as respiratory and central nervous system depressants like morphine, ethyl alcohol, and reserpine, have a slight protective action. Hypothermia, by lowering general metabolic activity, may also produce a several-fold protective

factor against radiation damage. However, it is not practical to produce this state in any large group of people simultaneously. Several lists of requisite medical supplies are provided.

(NSA:19:24753)

318) Nicholls, D.L.

THE FIELD APPEARANCE IN NUCLEAR BATTLE.

J.Roy.Army Med. Corps., 107: 198-204 (Oct. 1961)

Abstract: The problems expected to be encountered in collecting casualties during tactical warfare with nuclear weapons are considered, and the organization of the British army, particularly the medical services, for waging nuclear battles is outlined. Proposals for deployment of medical units to move closely conform to conditions expected to exist during use of tactical nuclear weapons are offered.

319) Ogden, C. Bruton.

DIET OF INFANTS AND CHILDREN IN DISASTER

Pediat. Clin. North Am., 9: 1025-31 (Nov. 1962).

Abstracts: Plans are proposed for feeding infants and children in case of thermonuclear attack. Plans can be made on every level from the national down through the individual family, the family being a most important link in the chain. The goal would be to have the nutritional needs of the infant uninterrupted. It is mandatory that each family with an infant under one year of age stock at least a 2-week supply of food for the baby, including milk (liquid or dry) and other foods (canned) normally used in infant feeding. Water, at least 2 qt/day, should be provided on the same basis. The possibility of not being able to sterilize water by the usual methods makes the use of iodine or chlorine practical and necessary. Sterilization methods are described, including use of purification tablets, iodine (ordinary household tincture, 6 drops/qt of clear water or 10 drops for cloudy water) and chlorination (achieved by adding 10 drops of any ordinary household bleaching solution containing sodium hypochlorite/gal of water). Materials necessary for one of these methods of steri-

lization should be included with the other store of supplies. Although radioactive contamination of food and water after nuclear attack will be a serious concern, food in sealed, unbroken packages, cans, or jars will be safe for consumption if the exterior of the container is wiped or washed. Much radioactive contamination in water may be removed by simply allowing the water to settle and then straining it through a paper towel or a finemesh cloth. Breast feeding under disaster circumstances would be desirable. The daily basic nutritional needs of infants toward which emergency food plans should strive to provide are tabulated. Minimum requirements are about 2/3 of basic requirements and could prevent real disaster from the nutritional viewpoints in infants. If essential nutrients are obtained from such foods as milk, cereal, and potatoes, other vitamins and minerals should be supplied in quantities to meet minimum requirements. For prolonged emergencies (30 days), vitamin C will become an important factor.

(NSA:17:39336)

320) Oliver, R.

MAXIMUM PERMISSIBLE LEVELS OF CONTAMINATIONS.

Sept. 1963.

Abstract: Maximum permissible levels of radioactive contamination in Great Britain are discussed from the point of view of the practical health physicist.

321) Olson, Robert L. et al.

FOODS FOR FALLOUT SHELTERS. I. THE PROBLEM.

Food Technol., 16: No. 8, 21-4 (Aug. 1962).

Abstract: How food supply and use interact with the design, management, and function of fallout shelters is discussed to indicate areas of research that will lead to a satisfactory plan for provisioning shelters. Some basic assumptions are made as to fallout-shelter requirements and human needs during shelter occupancy. About 2000 calories per occupant per day is considered appropriate.

Cost of a shelter food program should be kept to a minimum to make any such program available to as large a population as possible. There are 2 major procedures for provisioning fallout shelters. One procedure would be to channel food supplies through temporary storage in shelters into normal food use. This system is appropriate for most family-type shelters, shelters in buildings that house restaurants, and shelters in organized institutions where food is customarily served. Or, food stocks would be held until no longer acceptable, and then replaced with fresh stocks. This system is contemplated for most community-type shelters and all other shelters that do not customarily house food-serving facilities. The selection and maintenance of a food stockpile in such shelters are discussed. The influence of various conditions in the shelter during the stand-by period (temperature, humidity, air contaminants, vermin) on food stores is also considered.

(NSA:17:8441)

322) Osmond, R.G.D. et al.

IODINE-131 IN WATER SUPPLIES AFTER NUCLEAR ATTACK.

J.Inst. Water Engrs. 18: 459-64 (Oct. 1964).

Abstract: An experimental study was undertaken in 1962 in an attempt to determine the degree of transfer of ^{131}I from a catchment area to stream waters, advantage being taken of the Autumn series of nuclear test explosions. The chemical form of the radioiodine puts it into a different category from most other fission products of immediate significance, since cation exchange alone would not reduce its concentration in water supplies. The study was, therefore, undertaken to obtain data that should be of interest in Civil Defense planning. Data are tabulated.

(NSA:19:26596)

323) Oswald, Neville.

THE SCOPE OF MEDICAL PROBLEMS IN NUCLEAR WARFARE.

Practitioner, 187: 345-8 (Sept. 1961)

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Abstract: Medical aspects of handling casualties that might be expected as a consequence of a thermonuclear attack upon Britain are discussed. The responsibilities of physicians and laymen in caring for casualties are outlined.

324) Pace, F.C.

PROTECTION AGAINST NUCLEAR WEAPON FALLOUT IN EMERGENCY HEALTH SERVICES UNITS.

Med. Serv. J. (Can), 21: 95-112 (Feb. 1965).

Abstract: An outline is presented of methods developed by Federal Emergency Health Services to reduce the effects of early nuclear weapon fallout on patients and attending personnel within activated health units. The emphasis is on protection against the fallout radiation and its attenuation by shielding. The radiation detection instruments required are described and an example of the equipment issued to one type of Emergency Health Services unit, the 200-bed emergency hospital, is provided. Methods of calculating radiation intensities at various times after detonation are examined, and a new method of estimating shelter habitation times is presented, involving the use of mathematical tables of which the basic model and an example of the derived tables are given. Staff requirements for radiation control are discussed, and the qualification and duties of the responsible officer are explained. Priority demands of patients for shelter are defined, based on considerations of clinical conditions and physiological states. The potential hazards arising from direct contamination of persons, articles, and the interiors of buildings, as well as water and food, are discussed and an attempt is made to evaluate these contact and internal hazards in relation to the more serious external hazard within the framework of the early fallout situation. A discussion of protection of hospital diagnostic x-ray film against fogging by the fallout radiation is also presented.

(NSA:20:3797)

325) Pace, F.C. and Waters, W.R.

PROTECTION AGAINST RADIATION INJURY.

Med. Serv. J. (Can.), 17: 597-609 (Sept. 1961)

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Abstract: An account is given of the principles of protection against radiation injury and of the recommendations of Emergency Health Services, Department of National Health and Welfare, to those responsible for the protection of the health of persons to risk from nuclear weapon fallout radiations. Protection against injury is based on 2 concepts: procedures that result in avoidance of injurious exposures, and the establishment of levels of dosage that an individual should not exceed if injury is to be avoided. Owing to the long range of gamma radiation and its penetrating power, the avoidance of dangerous dosage can only be achieved by effective shielding. An analysis was made of various structures to determine their protective factor, and data are given for a number of typical Canadian domestic buildings. Recommendations for dosage control of the general public and of civilian and military operational personnel have been made. Protection against contact injury from radiation, is also discussed as well as hazards of ingestion of radionuclides. A shelter that will provide protection against gamma radiation will also protect against beta radiation, but, unlike that for gamma radiation, shielding against beta radiation can be effectively achieved by material as simple as ordinary textiles. Decontamination of exposed skin and protection of food and water supplies from fallout are also considered.

(NSA:17:25498)

327) Pace, F.C., & Waters, W.B.

CASUALTIES FROM NUCLEAR WEAPONS: A manual for Emergency Health Services, Canada.

Med. Serv. J. Can. 19: 219-46 (Apr. 1963).

Abstract: Preliminary to an outline of protective measures to be employed in a thermonuclear attack the following topics are discussed: nuclear phenomena and explosions, ionizing radiations from nuclear weapon detonations, and their blast and thermal effects. From these discussions it is concluded that, within the target area, the causes of death and injury are mainly blast and heat. Radioactive fallout and its effects are discussed, as is the problem of handling massive numbers of casualties. Estimated values are given for types of disease incidence based on the assumptions of heavy nuclear attack and of minimal preventive action. Expected frequency and handling of various types of burns (flash, flame, retinal, and periocular) are considered in detail, as are the prevention and treatment of blast injuries.

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328) Pace, F.C. & Water, W.R.

CASUALTIES FROM NUCLEAR WEAPONS. II. THE RADIOACTIVE FALLOUT.

Med. Serv.J. (Can.), 19: 341-63 (May 1963)

Abstract: A survey of the origin, physical characteristics, and effects on man of fallout generated by thermonuclear weapon detonations indicates the following hazards to human populations surviving the initial phase of an attack: radiation injury from the flash-radiation will not be observed in surviving casualties; radioactive fallout will be the source of radiation injury among survivors; the over-all hazard from fallout will be much more extensive in space than that from the immediate effects of blast and heat; fallout effects are subject to mitigation by simple means; the injuries caused by the fallout will be whole-body injury (the acute radiation syndrome) by highly-penetrating rays, skin injury by the less penetrating particles, and internal contamination by radioactive metabolites; and the biological effects will probably occur in this time-order. Clinical and pathologic effects of radiations from these external and internal sources are described in detail. Factors affecting the development severity of the acute radiation syndrome which are discussed, include: the quantity of radiation to which the body is exposed; the time period over which the exposure occurs; the part or parts of the body exposed; the presence or absence of other injuries; adverse physiological states; and age. A model is presented representing a hypothetical attack on Canada from which fallout doses in parts of various provinces are calculated, and attempts are made to evaluate doses expected to be encountered by rescue and rehabilitation personnel. A recommended outline of therapy is given. Decontamination of individuals and handling of contaminated casualties are discussed.

329) Palmer, Dearing W.

THE FIRST NUCLEAR AGE HOSPITAL WITH A SURVIVAL COMPLEX.

Hosp.Management, 90: 37-8 (Aug. 1960).

Abstract: The construction of hospitals with provisions for treating casualties of a nuclear war, and protected from blast and fallout by underground facilities, as well as some general topics relating to civil defense are discussed briefly. Vital facilities of the hospital described are located on two floors underground. These facilities will thus be protected against radioactive fallout

according to the design and structural recommendations of the Office of Civil and Defense Mobilization. In addition to the surgery, pathology, radiology departments, central supply, pharmacy, and food service, the protected facility will accommodate the patients and staff of the entire 750 beds being constructed above ground. With its own safeguarded air, water, and power supplies, 1200 people can occupy it for more than two weeks.

(NSA:19:15732)

330) Parnell, Furniss L.

CIVIL DEFENSE IN THE FOOD INDUSTRY. I. THE CAPABILITIES OF CHEMICAL, BIOLOGICAL, RADIOLOGICAL (CBR) WARFARE AGENTS.

Food Technol., 16: No.1, 15-17 (Jan. 1962).

Abstract: The possible effects of CBR agents on food supplies are discussed, with particular respect to the challenge such agents pose to the food industry. Cooperation of the food industry can ensure success of the government's 2-week supply food-stockpiling program for emergency survival. The emergency survival food products needed should be developed to meet these requirements: Ready to eat; requiring no cooking, although liquid may need to be added, and heat applied for palatability. Easy to store; compact in size, requiring no refrigeration, resistant to moisture, pests, and temperature variations, and having reasonably long shelf life. Easy to serve; calories per serving easily measured, together with minimum waste after meals. Nutritionally balanced; including complete dietary needs with appropriate ratio of proteins, carbohydrates, fats, vitamins, and minerals. Palatable; marketable to the public now for current use to establish acceptability, thus avoiding the hazard of strange food in an emergency. Economical; cheap enough to encourage people to buy for current use as well as emergency survival purposes. Such steps that food scientists and technologists may take to encourage stockpiling of food in both homes and shelters will assist the total Civil Defense program.

(NSA:17:6339)

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331) Petrov, M.

**EVACUATION AND TREATMENT OF THE SICK AND SLIGHTLY WOUNDED AS A
RESULT OF THE USE OF NUCLEAR WEAPONS.**

Voenno Med. Delo. 22: No.2, 3-8 (Apr. 1967).

Abstract: The evacuation and treatment of cases of light injuries caused by the action of nuclear weapons under wartime conditions is considered. Estimates are given of the ratio of injured of this type to the total number of injured. It is stated that according to Kapilevich and Aleksiyev, this ratio should not exceed 35% because of the prevalence of severe injuries from nuclear weapons. Treatment of cases of light injuries from nuclear weapons (including those of radiation sickness caused by exposure to doses of 100 to 200 R) should be in hospitals for the lightly wounded equipped for appropriate surgical aid and especially reorganized for the purpose.

332) Petrov, B.V. et al.

PROTECTION AGAINST FALLOUT

Moscow, Medgiz, 1963.

(In Russian)

(For English translation see AEC-TR-6634 entry No. 115).

Abstract: Data are given on fallout from nuclear and thermonuclear explosions and measures for protecting against fallout are discussed. Radiation dose monograms are included. Descriptions are given of dosimetric and monitoring equipment, decontamination measures and characteristics of fallout nuclei.

(NSA:18:8567)

333) Pigford, C.L.

PUBLIC HEALTH PROBLEMS IN CIVIL DEFENSE.

Texas State J. Med., 58: 652-3 (Aug. 1962).

Abstract: The role played by municipal health departments in civil defense is dealt with, with emphasis on maintenance of a water supply should there be a thermonuclear attack. Measures to be

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taken against biological and chemical warfare agents which may represent a serious hazard to emergency water supplies are also discussed.

- 334) Ramos, Eduardo.

IMMEDIATE PROTECTION AGAINST NUCLEAR BOMB EXPLOSION

Energia nuclear (Madrid), 5:87-100 (Oct-Dec., 1961).

Abstract: The design, construction, and stocking of fall-out shelters are summarized.

(NSA:16:27495)

- 335) Reese, Richard D. and Collins, Thomas A.

DISASTER TRAINING

Maroc Med., 40: 889-94 (Sept. 1961).

Abstract: Training directed toward disaster casualty control in the military, as exemplified by the specific programs conducted by the Air Force, is described. It is emphasized that the approach to casualty control must be oriented toward the full spectrum of disaster, with equal consideration of the type and scope of the disaster itself and the agent rendering casualty control service, whether it be the nonmedical individual in his survival self-help role or the medical profession in its larger role of contributing to national survival.

(NSA:17:18429)

- 336) Ridker, Ronald.

ECONOMIC RECOVERY AFTER NUCLEAR WAR.

Nucl. Inform., 5: No. 6, 1-12 (May 1963).

Abstract: Whether or not a modern community (St. Louis as an example) could survive a nuclear attack even if it were not directly hit is discussed. The area extending to a 100-mile radius from the center

of St. Louis is also included. Supplies such as food, clothing and shelter, water, electricity, coal, natural gas, petroleum products, and medical facilities and supplies are considered. The intervals following nuclear attack are also discussed.

(NSA:17:28596)

337) Robert, B.M.

INSTRUMENTS FOR CIVIL DEFENSE.

Health Phys. 6: 216-17 (Oct. 1961)

Abstract: Discussion is given on the types of instruments developed and purchased by the Office of Civil and Defense Mobilization (OCDM) since 1952 for the use of organized civil defense at all government levels. Particular attention is given to dosimeters and survey meters. A brief outline of the future plans of the OCDM is also given.

(NSA:16:10221)

338) Rocquet.

CONSUMPTION AND INSPECTION OF WATER AND FOOD IN THE EVENT OF A NUCLEAR CONFLICT.

Gaz. Med. France, 17: 2253-6 (June 1964). (In French)

Abstract: The norm of consumption of irradiated water for a human being can be determined by knowing the physical and biological half time periods of the quantity of water normally consumed by an individual. The most important cause of radioactive contamination will be non-fissioned elements from the bomb, radioelements produced by fission, and radioelements produced by neutron activation of certain soil elements. Knowing the radioactive periods of the isotopes will make possible the use of some food that was unfit for consumption. This food would become radioactive from exposure to ^{24}Na , ^{42}K , ^{32}P , and ^{35}S . Fresh foods become contaminated by metabolically active fission products (^{131}I , ^{89}Sr , ^{90}Sr , ^{137}Cs). A radiochemical analysis of contaminated fresh food should be made before consumption. Water contamination surpassing admissible

level would probably be rare, but decontamination of large quantities of water would be difficult. Water purification installations could not remove more than 70% of the radioactivity. If all the available water is contaminated, filtering through a sock filled with soil (not surface soil) will remove 50 to 70% of the radioactivity. Food and water in containers will be the least affected by radioactivity.

(NSA:19:38882)

339) Russell, Philip W. and Kimbrel, Laddie G.

ESTIMATES OF THE KILL PROBABILITY IN TARGET AREA FAMILY SHELTERS.

J. Am. Med. Assoc., 180: 25-9 (Apr. 7, 1962).

Abstract: Single-shot kill probabilities for persons with specified degrees of protection within a target area were calculated as a guide in the choice of family emergency planning and, specifically, to compare the safety of underground shelters versus basement fallout shelters. Probabilities were estimated by relating the calculated lethal radii for various weapon yields and the distance from the target point to a current ICBM aiming error. Curves were constructed showing kill probability at varying distances from the target point for selected megaton yields with specified degrees of protection. For example, a comparison showed that a person 4 miles from a 5-megaton ICBM target point would have a 97% risk of being killed within a basement fallout shelter, or an 8% risk within the specified underground shelter. The Office of Civil Defense family fallout shelter constructed in basements with 8-in., unreinforced concrete blocks was selected for analysis because its design has been so widely distributed. Certain fatality would occur in this shelter at a peak over-pressure of 10 psi, and it would collapse at approximately 3 psi. The underground shelter selected for analysis was one which would withstand 30 psi peak overpressure, and would have radiation shielding equivalent to 12 in. of concrete plus 30 in. of earth.

(NSA:17: 6345)

- 340) Sach-Rowitz, Alvan.

REQUIREMENTS FOR TRAINING IN FIRST-AID AND HOSPITAL PROCEDURES.

Minn. Med., 44: 268-73 (July 1961)

Abstract: Organization and training activities for medical care of casualties resulting from a nuclear attack are discussed. The training of lay individuals in first-aid and simple hospital procedures to assist trained medical personnel is recommended.

- 341) Santler, R.

MODERN FIRST AID AND TREATMENT OF BURNS WITH SPECIAL REFERENCE TO MASS CATASTROPHIES.

Wien.Med.Wochenschr., 116: 869-74. (Oct. 15, 1966). (In German)

Abstract: Extensive burns, such as those caused by a nuclear explosion, produce immediate shock and require treatment of the nervous system with drugs to block vagal activity and stimulate sympathetic activity, administration of analgesics and sedatives, and postural adjustments to improve circulation. Various measures, including removal of wet, dirty clothing fragments, proper covering of burns, rapid removal to treatment area, administration of replacement fluids, maintenance of body warmth, etc., are discussed in detail. Classification of burns, need for tracheotomy, movement of burn patients, evaluation of body functions, etc., are itemized. The need for community organization and participation in treatment of catastrophic burn cases is emphasized.

(NS1:22:49390)

- 342) Schonfeld, E.

DETERMINATION OF THE RADIATION PROTECTION FACTOR REQUIRED FOR A FALLOUT SHELTER.

Health Phys., 8: No.3, 313 (June 1962)

Abstract: The total integrated radiation dose, 1 to 4 weeks after a nuclear attack, will be approximately $I \simeq 3D_t t$, where I is the integrated dose in roentgen, t is the time after the attack in hours and D_t is the dose rate in roentgens per hour at the time t .

This approximate equation is valid only for values of t ranging from about 0.3 to 12 hr. If the dose rate after 1 hr is 1000 r/hr, then the integrated dose after 1 to 4 weeks will be about 3000 r. It is interesting to note that the integrated dose after 1 to 2 days will be about two-thirds of this value, or around 2000 r. Data are included on the probability of survival at various levels of exposure. The shielding protection factor, PF, required will be $PF = (I/LD) \simeq (3D_0t/LD)$. Thus, the PF depends on the initial dose rate and the LD selected. This same equation can be used to predict the chances of survival after a nuclear attack if the PF is known and a radiation detector is available. Examples are included.

(NSA:16:19198)

343) Sheedy, John A.

THE ROLE OF FORWARD MEDICAL SUPPORT IN HANDLING MASSES OF CASUALTIES IN ACTIVE NUCLEAR WARFARE.

Military Med., 127: 147-54 (Feb. 1962).

Abstract: Some facts and opinions are presented relative to the operational problem of handling situations wherein masses of casualties occur on the nuclear battlefield. To visualize this problem, a situation is assumed in which a battle group is inactivated by a nuclear weapon and initially a maximum number of living casualties would result. A hypothetical situation is envisaged in which a 20-kt nuclear weapon is detonated in an air burst near the center of formation of an infantry division deployed under combat conditions. The extent of casualties and their routing through medical units are discussed in detail. The medical and tactical considerations are outlined together with the advantages and disadvantages of each course of action. It was concluded that under the conditions of active nuclear warfare, situations resulting in masses of casualties can be anticipated.

(NSA:17:17678)

344) Siegel, L. & Curtin, R.

CIVIL DEFENSE COMMUNICATIONS RESEARCH, TASK 1, OCD WORK UNIT NO. 2211B. : Final Report - Vol.1.

(CR-65-419-21) Oct. 1965.

Abstract: The survivability problem of communications systems—from the viewpoint of analysis—is defined as the problem of relating varying levels of destruction to surviving traffic handling capability. Using linear graph concepts, three network survivability design parameters are specified and then related to varying levels of destruction. A procedure is then provided for translating surviving "connectivity" into a traffic-handling measure—the Priority Completion Index.

445) Siegel, L. and Curtin, R.

CIVIL DEFENSE COMMUNICATIONS RESEARCH. TEST 7, OCD WORK UNIT
NUMBER 2211B : Final Report Vol.1.

(CR-65-419-21) Oct. 1965.

Abstract: The concept is developed for analyzing and evaluating the evolving Civil Defense Communications System through periodic system evaluation exercises. A feasible method is presented for measuring operational capabilities using obtainable information about system characteristics, operational environments, and user needs. Appropriate criteria of system effectiveness are specified to allow selection of optimum system configurations and to provide the basis for evaluation of future systems and techniques for possible inclusion in the Civil Defense Communication System.

446) Soto, Luis Benitz.

INTRODUCTION TO MEDICAL-SURGICAL EMERGENCIES IN CASE OF NUCLEAR
EXPLOSION.

Rev. Sanidad Mol. (Mex.), 17: 151-3 (Mar-Apr. 1963).

Abstract: A comparison is made between the effects of nuclear and conventional (TNT) explosions, the types of casualties resulting in each case, and the specific effects of blast, heat and radiation from nuclear detonations. The projected effects on human populations are discussed with reference to the Hiroshima experience.

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347) Spock, Benjamin M.

SOCIAL PROBLEMS OF FALLOUT: NATURE OF PUBLIC CONCERN AND PSYCHOLOGIC REACTION.

Pediatrics, 41: Suppl., 342-51; Jan. 1968.

Abstract: Problems relating to public knowledge and concern of fallout and the responsibility of government agencies to keep the public better informed are discussed. It is proposed that, until there is proof that low-level radiation is harmless, there should be continual research, guidelines, and the establishment and promulgation of explicit plans of action for government officials, physicians, the dairy industry and perhaps other food processors, and the public, in case fallout increase markedly again. Solutions to the problem of fallout cannot be decided by scientists alone, nor should it be left to military leaders. In the democratic system public opinion is expected to provide guidance. Yet, public opinion on important nuclear questions remains largely uninformed. To present the public the raw materials from which this opinion can be derived is both the privilege and duty of the scientists. Public awareness of the dangers of radioactive fallout and civil defense needs has been stifled by unreasonable restrictions on information relating to the effects of nuclear weapons.

(NSA:22:51604)

348) Steenbeck, H.

THE EFFECT OF NUCLEAR WEAPON ATTACKS ON DENSELY POPULATED AREAS.

Sci. World, 8: 18-22(1964).

Abstract: Attempts were made to estimate the effects of various types of nuclear weapons (tactical to megaton strength) on cities in different attack situations. Several examples are provided to illustrate some possible situations. Thus, in a theoretical battle, lasting only a few days, in which three NATO army corps took part and in which 500 to 1000 nuclear strikes were made in an area of 25,000 km², the total explosive forces was equivalent to 20 to 25 Mton. The example showed that there was an average of 50 kton distributed over 50 km². However, these figures convey only a general view of the mean value of the distribution of the nuclear

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explosions in the region under consideration. In a discussion of the radiation effects, the initial radiation and the residual radiation are considered separately. Distribution of the dose caused by the initial radiation for the two examples of atmospheric explosion dealt with above is estimated. In an area of more than 60 km² the death of 50% of all unprotected inhabitants exposed to the initial radiation of a 50-ton weapon must be expected. The relation of these projected figures to civil defense problems and to genetic damage is also considered.

(NSA:19:36739)

349) Sullivan, Catherine M.

CIVIL DEFENSE IN A NUCLEAR AGE: PREPAREDNESS MAY MEAN SURVIVAL.

Amer. J. Nursing, 65: 121-3 (Nov. 1965).

Abstract: Responsibilities of nurses in caring for casualties during and after a thermonuclear attack are outlined. Medical care in fallout shelters will have the primary objective of providing survival care for the sick and injured and employing measures to prevent the spread of disease. If no physician is present, nurses will be responsible for caring for the sick and injured. The postattack program is planned to provide medical care to the sick and injured of the surviving population emerging from the shelters. Such a program can go into effect only after fallout radiation has decayed to a safe level. In the postshelter period, with the establishment of emergency medical and health services, nursing functions and responsibilities will broaden and increase. At this time the packaged Disaster Hospital would become operational. In the post-attack period, it is assumed, the normal incidence of illness will increase greatly because of a breakdown or deterioration of the environmental factors which control the peacetime health status.

(NSA:21:6528).

350) Taylor, Eleanor C. et al.

FOODS FOR FALLOUT SHELTERS. III. FOOD SELECTION AND RATION CONCEPTS.

Food Technol., 16: No. 9, 39-45 (Sept. 1962).

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Abstract: Factors associated with the period of shelter occupancy and various proposals for shelter rations are considered. The need for a high degree of acceptability is emphasized. Foods normally acceptable, if provided to the extent of 2000 calories per day, will probably contain the minimum essential nutrients. The amino acid balance should be satisfactory if dried milk or some other protein-complete food supplies part of the protein in the diet. However, high protein level is contra-indicated, if the water supply in a shelter is limited, to minimize renal activity. Ideally, a shelter food should satisfy the following criteria: palatable, or at least acceptable, to the majority of the shelter life of 5-10 yr; widely available; low total cost; simple preparation required; preparation requiring a minimum of heat and vapor; minimum trash volume; relatively low protein level; and high bulk density to conserve space in the shelter.

(NSA:17:8443)

351) Teplov, A.

DOSIMETRIC INSTRUMENTS.

Voennye Znaniya, No.7, 28-9(1964).

Abstract: Methods and means for detection of radioactive contamination are discussed. After a brief explanation of the types of radiation with which a civil defense organization will have to cope, description are given of four basic dosimetric instruments: roentgenometers, radiometers, dosimeters, and radioactivity indicators. It was concluded that some instruments used in the national economy and industry can fulfill the needs of civil defense.

(NSA:19:6294)

352) Terry, Luther L.

PREPAREDNESS AT THE COMMUNITY LEVEL--AN URGENT GOAL.

N.Y. State J. Med., 63: 1972-6 (July 1, 1963)A

Abstract: Development of plans at the local level to ensure survival of maximum numbers of the population following a thermonuclear attack is discussed. Seven elements considered necessary to prepare

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the community for any emergency, are outlined. These include medical self-help training of the population, effective utilization of available medical and allied health personnel, expanded and coordinated operation of all available hospitals and other health facilities, prudent use of medical supplies and equipment, adequate supply of safe water for emergency use, provision for the rehabilitation of damaged health facilities, and restoration and maintenance of the health of the surviving population. It is proposed that emergency preparedness plans should utilize and build on existing health organizations, services and professional personnel. Intensification of the usual programs should constitute a first line of health defense in any emergency and a sense of readiness and a core of skills should be developed that are indispensable in a disaster situation. The medical profession bears a heavy responsibility in community programs of health preparedness, in times of disaster, physicians will give leadership to all health operations. They should also guide the development of disaster preparedness plans by setting forth priority needs for health skills, by outlining the special training that is required, and by determining the manner in which health personnel can be best organized in an emergency to assure the most efficient operations. In this way, the community can be sure that all health personnel will know their assignments, and will be equipped to carry them out under any circumstances. Emergency health training can also be put to good use against the hurricanes, floods, tornadoes, and other misfortunes which disrupt entire communities and cause untold misery. It is suggested that every disaster, or every threat of disaster, should be used as a training ground for civil defense operations. The capability of handling a hypothetical attack should provide a means of responding effectively to natural disasters. Civil defense, it is suggested is a cooperative undertaking, an interlocking job calling for greatest application of ingenuity, perseverance, and leadership. It involves all members of the health professions and all levels of government, but begins with the local community.

353) Thomas, R O.

NUCLEAR WEAPONS, WAR, AND SURVIVAL.

Med. Bull. U.S. Army Europe, 21:124-5 (Apr. 1964).

Abstract: The effects of nuclear weapons and their influence upon medical operations and patient care are briefly reviewed. Consider-

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ration is given to prompt and residual weapons effects, shelter design, food, water, patient care, and the development and implementation of plans. The prompt effects occur in the first minute as blast, thermal, and initial radiation. Casualty estimates utilizing computer techniques reveal that the use of nuclear weapons will result in an increase in killed in action as well as a reversal of the present downward trend in died of wounds cases. Increased difficulty will be experienced both in locating and recovering casualties, and this will effect the number of killed in action. Computer data further reveal that the patients will be suffering from combined blast, thermal, and radiation injuries. With such multiple injuries and delayed treatment, the number of casualties from wounds will increase and, therefore, the load placed on treatment resources will be far greater than ever experienced. Under such circumstances, medical treatment units cannot be expected to provide personnel for search, rescue, and first-aid work. Unit level medical service will continue, though, to perform its normal role including first aid, search, and rescue. Fallout will provide much more serious obstacles to effective medical operations than prompt effects, for several reasons: fallout involves a greater area; the radiation lasts for days; fallout increases the possible patient load; and it interferes with movement. Protection factors are considered in relation to fallout. Shelters that have been used in Seventh Army exercises are basements, tunnels, caves, and old fortifications. In selecting any of these shelters the first operational consideration is that the medical unit should function outside the shelter until forced into it. Medical units suffer a great loss in efficiency once an operation is begun in a shelter. Also considered are adequacy of shielding, ventilation, food, water, waste disposal, and traffic control. Analysis has revealed that the internal dose received from consumption of contaminated rations is less than one tenth the external exposure received from the environment from which the food or water was obtained. With the program of training and a standard operating procedure which has been developed, emphasis is placed on the proper time to move into shelters, priorities of movement of personnel and equipment, monitoring procedures, radiation exposure control measures, communications links, and traffic control in shelters.

(NSA:19:19554)

354) Thomson, Daniel.

CIVIL DEFENSE IN THE UNITED KINGDOM.

(Ministry of Health, London). N.Y. State J. Med., 63: 1841-3
(June 15, 1963).

Abstract: An account of Civil Defense in the United Kingdom, as it affects the medical profession, is given. The National Medical Manpower Committee, composed of eminent doctors, advises on the best methods of utilizing medical manpower, and makes allocations of physicians between the Armed Forces and the various civilian services.

355) Trubey, D.K.

CALCULATION OF THE COMPONENTS OF THE EXPOSURE IN A BASEMENT DUE TO FALLOUT.

June 1967.

Abstract: From 13th Annual Meeting of the American Nuclear Society, San Diego, Calif., June 11-15, 1967. (CONF-670602)

(NSA:21:36316)

356) Van, Camelbeke, M.

PROTECTION OF CIVILIANS FROM NUCLEAR RADIATION.

Rev.Praticien, 12: (8), Suppl. Mar. 11, 1962.

Abstract: Civil Defense measures employed by various western nations are discussed.

(NSA:17:8474)

357) Van Reen, Robert. et al.

NUTRITION OF 96 NAVAL RECRUITS DURING A SHELTER HABITABILITY STUDY.

J.Am. Dietet. Assoc., 42: 117-24 (Feb. 1963).

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Abstract: The survival ration utilized for a two-week shelter habitability study proved nutritionally adequate for a group of healthy, young male subjects. The major source of nutrients was a commercial survival ration cracker prepared by the National Biscuit Company. The crackers were supplemented with a variety of jams, condensed soups, peanut butter, sugar, and Pream. Data are presented on the composition of survival cracker, acceptability of the crackers, daily caloric intake, water balance in the subjects during the two-week shelter trial, and clinical findings on the subjects at the beginning and end of the two-week shelter trial.

(NSA:17:27612)

358) Villforth, John C.

PUBLIC HEALTH SERVICE NATIONAL FALLOUT SURVEILLANCE PROGRAM.

J. Air Pollution Control Assoc., 13: 222-7 (May 1963).

Abstract: It is shown that the Public Health Service, through its system of federal-state surveillance networks, is capable of immediate nationwide assessment of the levels of radioactive contamination in the environment. A review of the actions taken in response to the Soviet tests last fall has shown how the Radiation Surveillance Network operates as an "alert" to the need for increased monitoring by other surveillance systems. A comparison of the levels of the principal radionuclides in milk with the ranges established by the Federal Radiation Council has indicated that control measures are not warranted at present. However, expanded federal and state surveillance capabilities are needed (1) to determine when and in what areas control measures should be initiated; and (2) to carry out continuous monitoring in order guarantee the effectiveness of such measures once they have been instituted. This increase surveillance effort at the federal and state levels will help assure an improved program to deal with hazards from nuclear weapons testing.

(NSA:17:25494)

359) Vinall, E.P.

FALLOUT DRILL TESTS. PERSONNEL AND EQUIPMENT RESOURCES.

Hospitals, 38: No.18, 53-4 (1964).

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Abstract: The mechanics of conducting a fallout survival drill was designed to enhance staff proficiency in providing practical survival means for patients, hospital staff, and the community are discussed.

(NSA:19:18207)

360) Visher, Paul S.

NATIONAL SHELTER PROGRAM AND ITS MEDICAL ASPECTS.

(Department of Defense, Washington, D.C.) N.Y. State J. Med., 63: 3294-7 (Nov. 15, 1963)

Abstract: Various aspects of development of a fallout shelter system in the United States are discussed. It is estimated that it should be possible to save 60 million people in a counter-force attack. These people would be in shelters having a protective factor of 100 or better. In the country today are located nearly 60 million spaces that have a protective factor of 100 or more. There are 20 million additional spaces that have a protective factor or between 70 and 100, 40 million additional spaces that have a protective factor of between 40 and 70, and 80 million spaces that have a protective factor of between 20 and 40. The amount of shielding, space per person, ventilation, and food and water stocks for shelters is estimated. The kind of medical equipment and supplies to be placed in shelters is discussed.

361) Von Zitzewitz, Horst.

TOTAL DEFENSE AND CIVIL PROTECTION IN NORWAY

Prof. Civ. Secur. End. No.157, 17-24; Sept. 1967. (In French)

Abstract: The concepts of total defense and civil protection as used in the Norwegian defense plans are defined. The civil protection in Norway is described within the frame work of the total defense of Norway and Denmark. The obligation of defense services for all civilians, the organization of the defense service, the combatant forces, and the civil defense are briefly described. The mission and organization of the civil protection force and the alarm service are given. Evacuation plans and the construction of fallout shelters are discussed. The local forces available for all out

defense including the mobile forces and the industrial civil protection are described.

(NSA:22:16734)

362) Waskow, Arthur J.

THE SHELTER-CENTERED SOCIETY.

Sci. Am., 206: 46-51 (May 1962).

Abstract: A conference on the potential implications of a national civil defense program, held by the Peace Research Institute in Washington, D.C. on January 13 and 14, 1962, is reported. On one conclusion the conferees agreed: the existence of a shelter-centered civil defense would be a wholly new departure in U.S. history. Because the prospect is without precedent they did not attempt to produce ironclad predictions of what would happen. They sought rather to define the problems that are likely to develop. Evidence is presented which suggests that existing stresses and strains in the community would be amplified by emphasizing the threat of war. Of all the questions raised by civil defense, the conferees agreed, the most troublesome and dangerous is the question of how the commitment, once made, could ever be limited or reversed. Other topics discussed were attitudes toward disarmament, public opinion and official views toward civil defense in the U.S.S.R., and the problems that would arise were the civil defense program abolished now.

363) Waters, W.R.

A CLASSIFICATION OF CANADIAN HOSPITALS BASED ON FALLOUT EXPOSURE PROBABILITIES.

Ottawa, Canadian Dept. of National Health and Welfare, 1962.

Abstract: This survey is based on a computer study conducted by the Canadian Army Operational Research Establishment of the 96-hr dose of γ radiation which would be delivered at a number of points across Canada as a result of a heavy attack on North America. As designed, the computer program provides a figure of probability of any selected dose, at any particular point, not being exceeded. In designing the program, the Establishment included points where

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hospitals of interest to Emergency Health Services were located. It was not possible to include all hospitals but the major portion of those on the Emergency Health Services list was used. From the resulting data, hospital locations have been classified according to the probability of their being exposed to less than a 600-R dose integrated over 96-hr after the nuclear event. The 600-R point was selected since it was considered that most hospitals would have a limited area available where the protection factor was around 25 and there would be a larger area where the factor would be about 5 to 10; thus, the hospital would be able to function within its own confines throughout the period. The classification scale chosen was: Class A, 100% to 85% probability of dose not exceeding 600 R; Class B 84% to 75%; Class C, 74% to 65%; Class D, 64% to 55%; and Class E, less than 55%. Thus, hospitals in class "A" or "B" localities would be preferred establishments. Those in class "C" locations would be less relied on; while those in classes "D" and "E" would be avoided. An examination of the integrated dose at the 90% probability level for the points of interest permit an estimation as to whether or not the intensity at any point will be greatly in excess of 10³/hr at H + 24 or H + 48 hr. Thus an idea is obtained as to whether or not there would be access to the installation from the outside at these times. This report is regarded as a planning guide and not as an operational instruction; it should, however, be of use to persons faced with making decisions in relation to radiological conditions concerning which little may be known in advance of the event.

(NSA:20:39162)

364) Weidemier, G.A.

PLANNING A FALLOUT PROTECTION PROGRAM.

Hospital Progr., 45: 178-82 (May 1964).

Abstract: Three major topics are discussed in considering the importance of a fallout protection program: first, a general description of what happens when a nuclear explosion occurs; second, a discussion of the methodology of evaluating the potential fallout protection of any building, and third, consideration of the habitability features needed in a fallout shelter. Two features contribute to the protection found inside a building: first, the shielding quality of the materials of construction of the roof, walls, and floors; second, the distance to the nearest source of radiation.

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In discussing these features, the terms mass thickness, reduction factor, and protection factor are defined. The effect of fallout material on the roof and on the ground adjacent to the building are considered separately. Because window opening and the effect of other buildings may vary from wall to wall, a reduction factor should be calculated for each wall as well as for the roof. The reduction factors for the roof and walls of any building are calculated with the aid of a table of mass thickness values for various construction materials and graphs which give the relation between mass thickness, area of effective radiation, and reduction factors. The protection factor is the reciprocal of the sum of all reduction factors for the building, and is usually calculated for a specific location in the building. In most cases the core area in a large building, such as a multifloor hospital, would offer considerably more protection than a point near window on the basement or ground floor. After the fallout protection has been determined, the additional shielding needed to bring the building up to the desired level of protection may be calculated. Fourteen suggestions are made for improving the habitability of shelters.

(NSA:20:7326)

365) Wengrovitz, Seymour and Hirtle, Gordon W.

NEW TRENDS IN FALLOUT PROTECTION

Civil Eng. (N.Y.), 35: No. 7, 47-9 (July 1965).

Abstract: The initial of the National Fallout Shelter Program carried out by engineers and architects who attended a course developed by Office of Civil Defense is discussed; emphasis is given to incorporation of preplanned dual-purpose shelter areas in original design of new structures; incorporating "slanting" techniques for providing fallout protection. These techniques affect location and quantity of window areas, site conditions, basements, entrances and exits, interior partitions, walls, floors and roofs, and architectural arrangements.

(NSA:22:14742)

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366) Whitney, John M.

MOBILIZATION OF THE NATION'S HEALTH RESOURCES.

J.Am. Vet.Med. Assoc., 139: 122-6 (July 1961).

Abstract: The organization of physicians, paramedical personnel hospital facilities, and drug supplies as a civil defense measure against thermonuclear attack is discussed.

(NSA:17:17631)

367) Wigner, Eugene P. (ed.)

WHO SPEAKS FOR CIVIL DEFENSE.

New York, Charles Scribner's Sons, 1968.

[Bk7]

Abstract: Nuclear war and civil defense are discussed from the standpoint of the direct and indirect effects of nuclear explosions and protective measures that may be taken against them. An historical survey of civil defense in America is also presented. Information is presented that is critical of the government's handling of civil defense; on problems that must be solved for an adequate civil defense program; a survey of civil defense in other countries; and scientific aspects of the problem, not only with respect to weaponry, but also what is practicable and not practicable in the entire field.

(NSA:22:42930)

368) Stewart, Wilma G.

RADIATION HAZARDS CONTROL IN SURVIVAL OPERATIONS IN THE EVENT OF A NUCLEAR WAR.

Can. Med. Assoc. J., 87: 1173-7 (Dec. 1, 1962).

Abstract: Concepts of radiation protection in survival operations are explained, and procedure devised to control radiation hazards for the protection of the population and maintenance of the operating efficiency of survival operations personnel are presented.

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The major hazard is external exposure to penetrating gamma radiation. Radiation exposure guides are cited indicating that persons may be exposed to not more than 100-r whole-body radiation in a 6-week period, or 200-r whole-body radiation in a period in excess of 6 weeks, without loss of operational efficiency. Where exposures greatly exceed 200 r for the emergency period, additional exposures at operational levels will probably be followed later by appreciable damage to health. The rules are based on the need for preserving operational efficiency of a limited number of persons. For the general public, 25 r should probably be the upward limit. Beta radiation from fallout deposited on skin or clothing may produce burns, but the injuries will not be incapacitating and can be controlled by simple procedures. The internal hazard is mainly from ingestion of food or water contaminated with radioactive material. For protection, only canned or packaged foods and water from covered or deep wells should be consumed during the early days after a nuclear attack.

(NSM:17:12070)

369) Trinch, R.E.

THE ROLE OF THE ARMY IN NATIONAL SURVIVAL.

Can. Med. Assoc. J., 87: 1146-53 (Dec.1, 1962).

Abstract: Responsibilities of the Canadian Army in civil defence against nuclear attack are discussed. The responsibilities are: provision of technical facilities and operation of a system to give warning to the public of the likelihood and imminence of an attack; determination of the location of a nuclear explosion and the patterns of fallout, and warning of fallout to the public; assessment of damage and casualties from attack and fallout; control, direction, and carrying out of re-entry into areas damaged by a nuclear explosion or contaminated by serious radioactive fallout -- decontamination work in those areas, and the rescue of and provision of first aid to those trapped or injured; direction of police and fire services in seriously damaged or contaminated areas, which are the object of re-entry operations; direction of municipal and other services for the maintenance and repair of water and sewer systems; provision of emergency support to provincial and municipal authorities in the maintenance of law and order and in dealing with panic or the breakdown of civilian authority; and maintenance and operation of emergency communication facilities. A nuclear detonation and fallout reporting system is described in detail.

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Fallout reporting posts are being located throughout populated areas, generally about 45 miles apart east and west, and 15 miles apart north and south. These posts are being located with existing installations of various Federal departments and other agencies. The system of fallout reporting posts will involve some 2000 stations throughout Canada. All are being equipped with radiation measuring equipment, also with extra equipment for about one-third of the posts to enable determination of the location of random bursts.

(NSA:17:12067)

370) Wilson, J.E.

CIVIL DEFENSE.

1963.

Abstract: The genesis of the national civil defense program, its organization, and mission are discussed. Shelter support systems including: a legal basis from which state and local governments can operate; and organizational capability; warning systems to provide notice of attack; control centers from which governments can conduct emergency operations; radiological monitoring systems; communications systems; emergency information systems; and a training capability to assure the technical and managerial skills required to use the systems are discussed.

371) 1964.

PROCEEDINGS OF THE SYMPOSIUM ON SOIL-STRUCTURE INTERACTION,
(TUCSON, ARIZ, JUN 8-11, 1964).

Tucson, Ariz. Univ. of Arizona,

Abstract: Thirty-six papers are included. Topics covered include: basis of current, criteria for design of underground protective construction, wave propagation in soil media, ground motion instrumentation, state of the art, similitude and model studies, analytical and experimental studies, and design and prototype studies.

(NSA:19:13607)

372) United Nations, New York, U.N., 1968.

EFFECTS OF THE POSSIBLE USE OF NUCLEAR WEAPONS AND THE SECURITY AND ECONOMIC IMPLICATIONS FOR STATES OF THE ACQUISITION AND FURTHER DEVELOPMENT OF THESE WEAPONS: Report of the Secretary-General transmitting the study of his consultative group (A/6858).

Abstract: To know the true nature of the damages we face this report may be an important step. It covers the following topics: effects of the possible use of nuclear weapons, economic and security implications of the acquisition and further development of nuclear weapons, general characteristics of nuclear explosions, genetic effects of nuclear radiation and basic costs of nuclear warheads.

373) DOCUMENTS ON DISARMAMENT.

United States Arms Control and Disarmament Agency Publication-24.

Abstract: Basic official documents regarding international development on disarmament and related matters are included. The documents are arranged in chronological order. Bibliographic aids include lists of abbreviations, international organizations and conferences, and persons. The compilation also includes a bibliography, a topical list of documents, and an index.

(NSA:19:5597)

374) Verlag des Ministeriums für Nationale Verteidigung, Berlin. 1960.

NUCLEAR WAR AND NUCLEAR WAR PROTECTION.

(Translated into German from "Atomnoe Oruzhie i Protivoatomnaya Zashchita.")

Abstract: The present edition should give to those in the army, air defense, and other institutions concerned with nuclear warfare an accurate survey on the principles, construction, and effects of nuclear war. Topics discussed include the structure of matter, nuclear war, the pressure wave, light radiation, ionizing radiation, activation of the land, radiation protection in the open, calculation of shielding factors, dosimetry, and precaution for radiation

protection in active zones.

(NSA:16:24032)

375) Woods Hole, Study Group.

• CIVIL DEFENSE. PROJECT HARBOR SUMMARY REPORT.

(A Report by a Summer Study Group at Woods Hole, Massachusetts. Publication 1237.)

Abstract: A group study was made of civil defense problems. The likely effects of various kinds of attack on U.S. were examined, and the technologies of civil defense were considered both independently and in conjunction with military defense systems. The six-week meeting was divided into six panels: Acceptance and Impact, Education and Training, Strategy and Tactics, Future Weapons and Weapons Effects, Immediate Survival, and Postattack Recovery.

(NSA:19:13689)

376) AHA STATEMENT ON CIVIL DEFENSE SHELTER PROGRAM.

Hospitals, 37: 198-212 (Sept. 16, 1963).

Abstract: The statement on the Civil Defense Shelter Program, H.R. 3516, was presented by the American Hospital Association (AHA) before the Subcommittee No. 3 of the House Committee on Armed Services on June 20, 1963. The role that AHA has assumed in the preparation of hospitals for natural and nuclear disasters is outlined and AHA's support to legislation that would authorize federal funds to assist hospitals in providing approved public shelter space is offered. The efforts of AHA in civil defense preparedness are outlined. After considering the situation in the event of an all-out attack, it was decided that hospitals would be concerned particularly in six areas of activity: man-power, supplies and equipment, construction, financing, patient care, and communications. Subcommittees were then appointed to deal at length with each of these areas and to develop a policy and procedures to be followed by hospitals in the event of nuclear attack. It was concluded by AHA that national survival could best be obtained by providing for

the protection of as large a segment of the public as possible. It is believed that some hospitals may be able to adapt existing facilities for shelter purposes with modest expenditures. However, to expand the capabilities for many hospitals for public shelter space, basic changes in existing structures or new construction may be necessary. AHA determined that the maximum federal allotment of \$2.50 per ft² is not sufficient and would necessitate hospitals obtaining very substantial amounts of money on their own in order to undertake the necessary shelter space construction. AHA urges therefore, that the Congress reconsider the maximum of \$2.50 of federal matching presently proposed, and questions whether this amount is sufficient to defray the cost of adapting enough space for shelter purposes in hospitals. This amount would not constitute a sufficient federal contribution to stimulate development of new shelter space. The need for a single civil defense authority is also proposed.

377) CANADA'S EMERGENCY HEALTH SERVICES.

Can. Med. Assoc. J., 87: 1202-3 (Dec. 1, 1962).

Abstract: A review of the medical aspects of civil defense planning is presented.

(NSA:17:30768).

378) DISCUSSION OF PROJECT HARBOR SUMMARY REPORT AND OF CNI CRITICISM OF HARBOR.

Sci. Citizen, 7: No. 9, 1-28 (Aug. 1965).

Abstract: Biological and sociological effects of nuclear weapons are discussed in view of defense against such effects. It is concluded that: any civil defense program can be rendered useless by an enemy step-up in offensive power; sociological and economic recovery pose more difficulties than indicated in the Project Harbor Summary; biological damage from a nuclear war may be much more severe than estimated by the Harbor Study; and civil defense cannot provide

enough defense in large-scale nuclear war to make such a war a rational measure of national policy.

(NSA:20:40738)

379) EMERGENCY MEDICAL TREATMENT UNIT. PHASE I.

Med. Bull. U.S. Army, Europe, 18: 195-7 (Oct. 1961).

Abstract: The medical treatment of mass casualties resulting from a thermonuclear explosion is considered. An outline is given of some problems in the treatment of mass casualties.

(NSA:19:15803)

380) MASSACHUSETTS PREPARES FOR MASS EMERGENCY.

Hospitals, 37: 49-53 (Dec. 16, 1963).

Abstract: A civil defense program is described whereby Massachusetts hospital personnel and allied health workers take intensive training in disaster planning at a four-day workshop. Although the training program's main emphasis is on familiarizing the students with the crated hospital's supplies and equipment, and training them to set it up and operate it swiftly and efficiently, the program has broader applications. It provides grounding in mass casualty management and instructions in civil defense planning that can be adopted by individual hospitals. Instruction is given in shelter management, handling mass casualties, methods for developing radiological monitoring capabilities within the hospital and the community, and operation of radiological instruments. It is suggested that this Massachusetts project may become the prototype program for emergency hospital training centers in the other 49 states.

381) NUCLEAR ATTACK AND INDUSTRIAL SURVIVAL.

Electronics, 35: No.2, S1-S16 (Jan. 12, 1962).

Abstract: The problems of U.S. industrial survival and recovery from nuclear attack are discussed and methods of protection are described. The effects of an atomic attack are shown both graphically and tabularly. These effects are divided into blast and thermal effects and areas affected by fallout. The effectiveness of fall-out shelters is shown for both military and civilian targets. The organization necessary for setting up a survival plan is also outlined along with the preparations that can be made for post-attack recovery.

(NSA:16:5616)

382) NUTRITION IN FALLOUT SHELTERS.

Nutr. Rev., 21: 298-300 (Oct. 1963).

Abstract: Results are reported from a fallout shelter habitability study. Emergency rations were fed to young males in good health for a 2-week period. The ration was based on a commercial survival cracker, containing about 30 calories each, supplemented by hot condensed soups, jams, peanut butter, sugar, and a cream substitute for use in instant coffee. The average water intake was 1,290 ml/day with additional 170 ml/day furnished in the rations. No clinically apparent deficiency states were observed in the men at any time.

383) PROBLEMS OF FOOD SUPPLY AND SANITATION IN DISASTER.

Sanitarian's J. Environ. Health, 25: No. 6, 423-32 (May-June 1963)

Abstract: It is assumed that in initial enemy attack with thermo-nuclear weapons, an attempt will be made to deal a knock-out blow; it is further assumed that biological and chemical warfare weapons, coupled with sabotage may be used. Nuclear weapons will subject food supplies to the effects of blast, heat, and radiation, either induced or from fallout. Chemical and biological agents will complicate food salvage and decontamination procedures. In the development of practical plans to cope with the multiple food problems, emphasis should be given to salvage procedures for typical types of food and disposal methods for dangerously contaminated food supplies and wastes.

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